

05664000

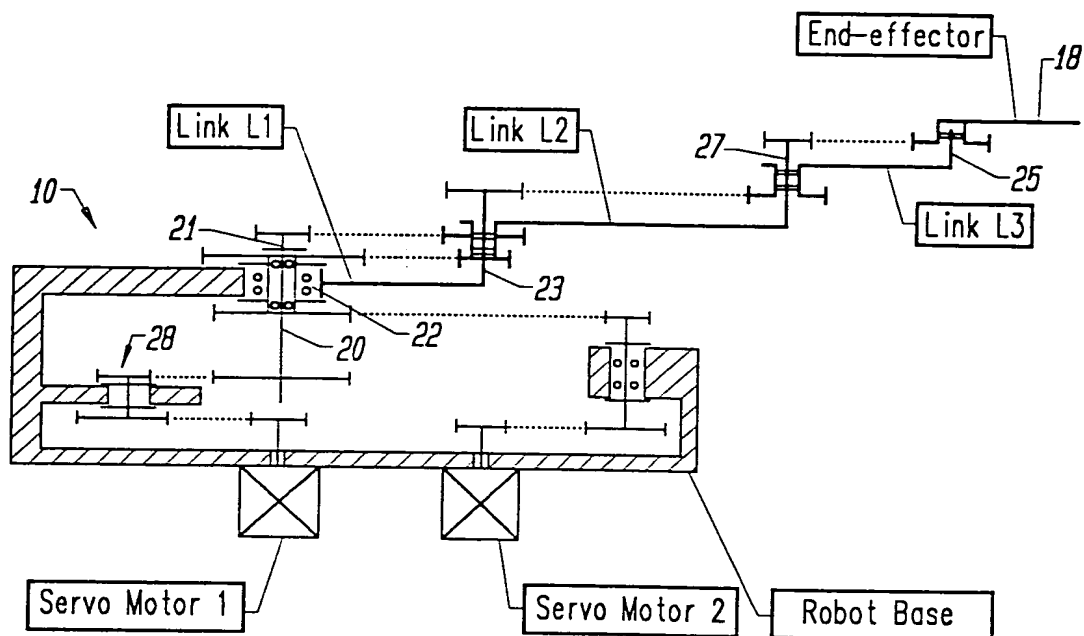


FIG. 1A
(PRIOR ART)

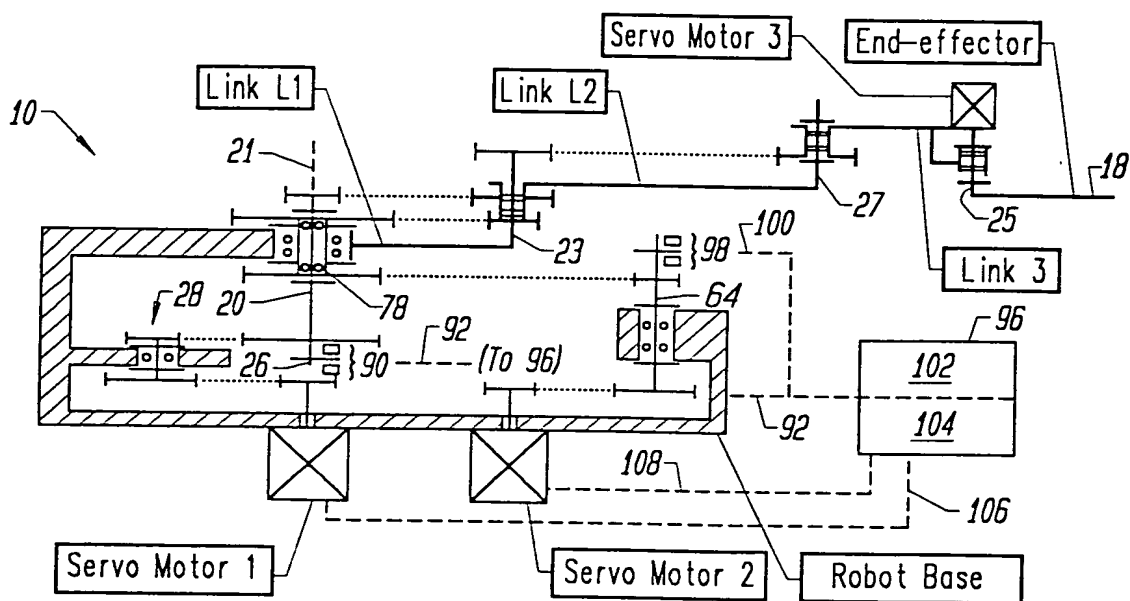


FIG. 1B

The diagram illustrates a mobile robot system. A central circular component is labeled "Robot base". A "Robot arm" is attached to the base, consisting of two segments, L1 and L2, and a gripper at the end. The gripper is shown holding a small object labeled 18. The arm segments are labeled L1 and L2, and the gripper is labeled 18. A third segment, L3, is shown extending from the gripper to a point labeled 21. The robot is surrounded by several rectangular blocks labeled "W", representing workpieces. To the right, a "Cassettes" unit is shown, which is connected to the robot base and the robot arm. The cassettes unit is labeled "C" and is connected to the robot base and the robot arm. The diagram shows the robot arm in a position to pick up a workpiece from a cassette.

The diagram illustrates a system with a shared cassette and multiple processes. At the top, a box labeled "Shared cassette" is connected by lines to specific blocks within three processes: "Process k-1", "Process k", and "Process k+1". Each process contains a row of blocks, some of which are shaded with a stippled pattern. Below the process boxes, two robots are shown: "Robot k" and "Robot k+1". Each robot is represented by a circle with a central dot and a line extending to a point. "Robot k" is positioned near the bottom left, and "Robot k+1" is near the bottom right. Two regions are labeled "Working envelope of robot k" and "Working envelope of robot k+1", each indicated by a dashed line and an arrow. The diagram also includes labels "C" pointing to specific blocks in Process k-1, "10" and "10'" pointing to specific points or lines, and "C" pointing to a block in Process k+1.

FIG. 3A

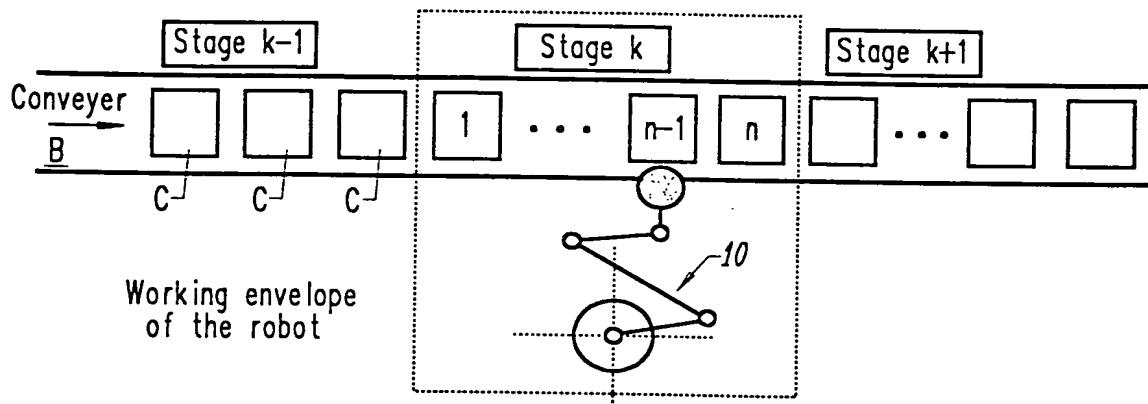


FIG. 3B

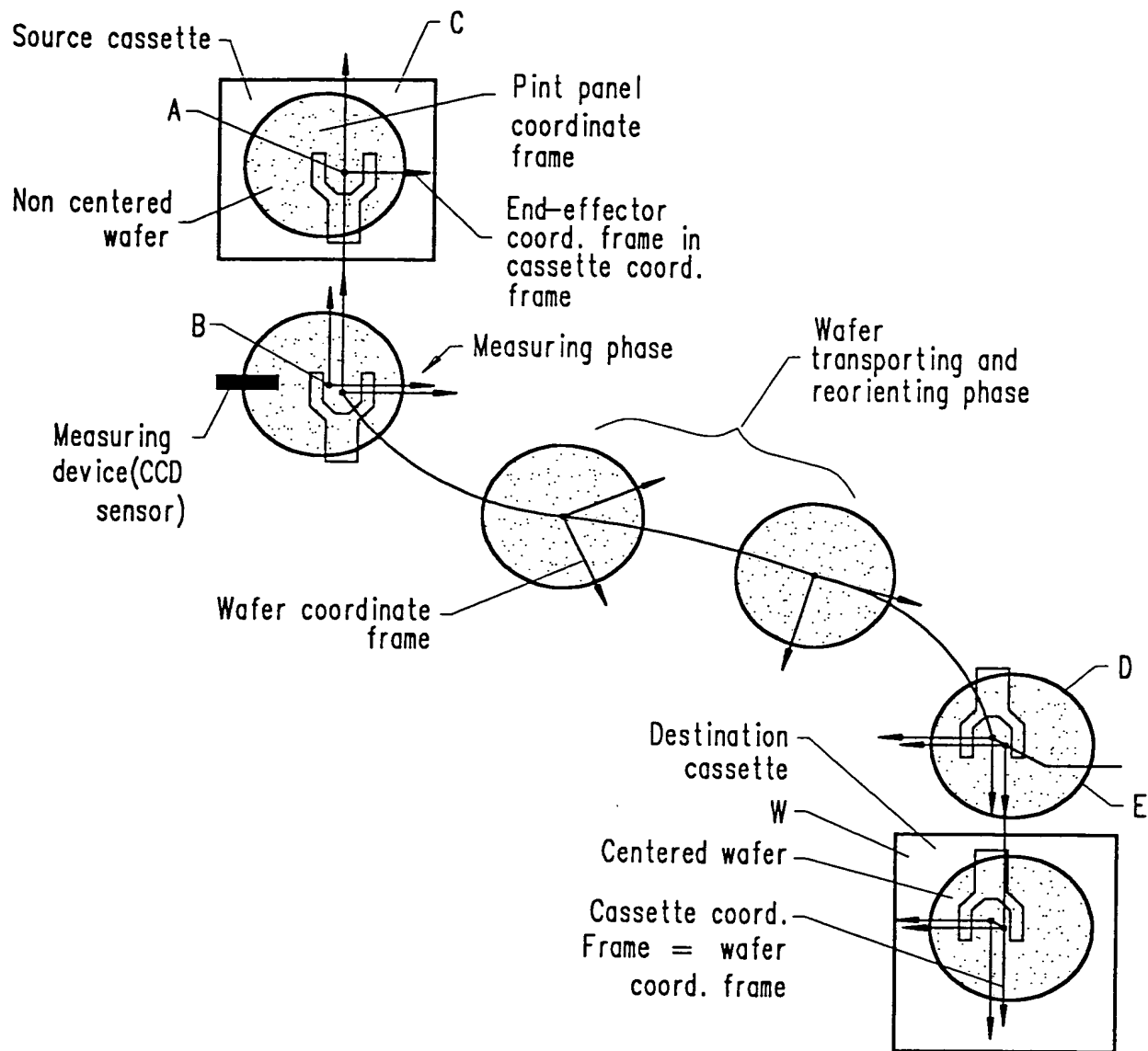


FIG. 4

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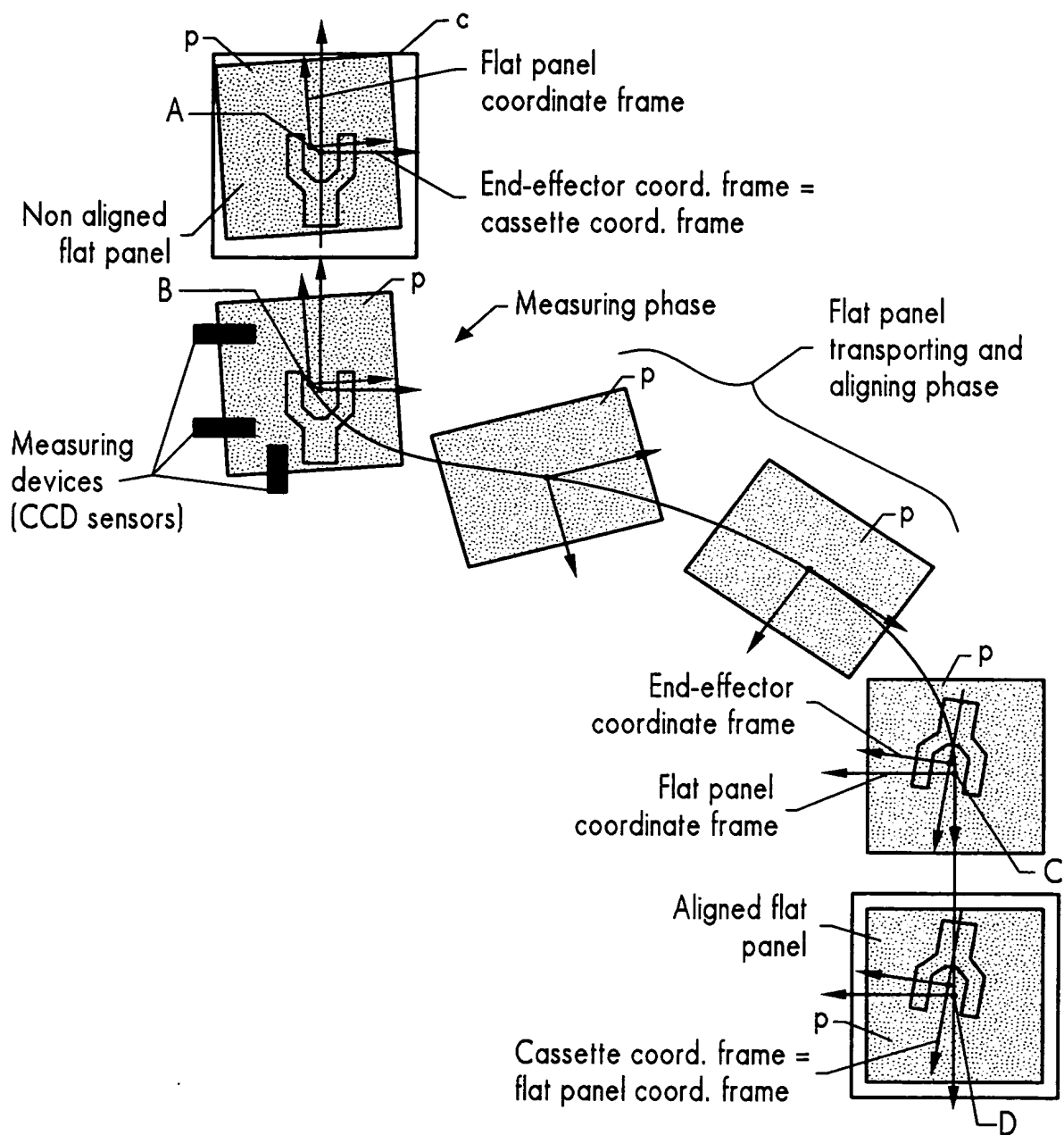


FIG. 5

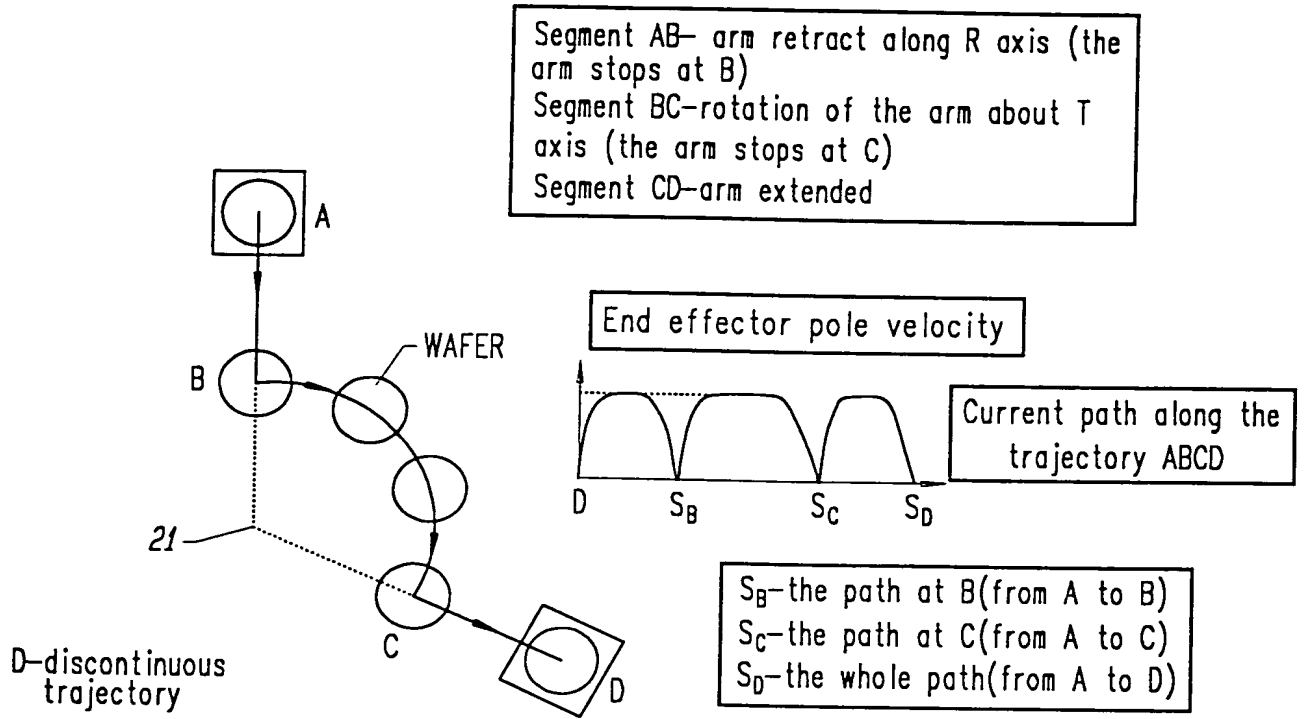


FIG. 6A
(PRIOR ART)

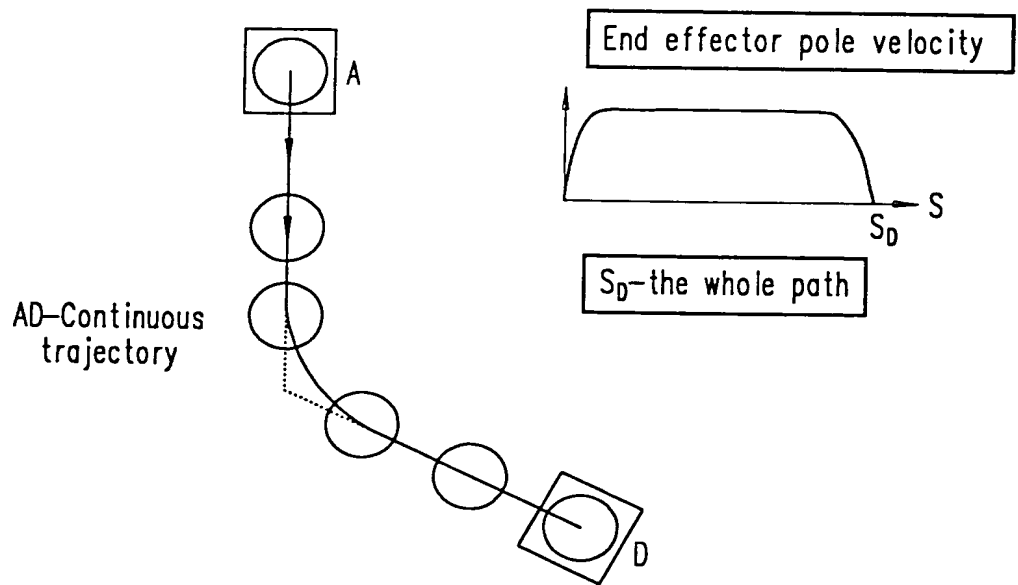


FIG. 6B

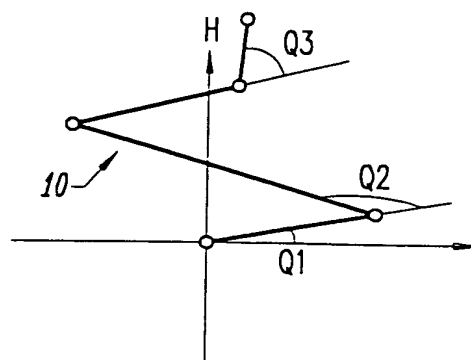


FIG. 7

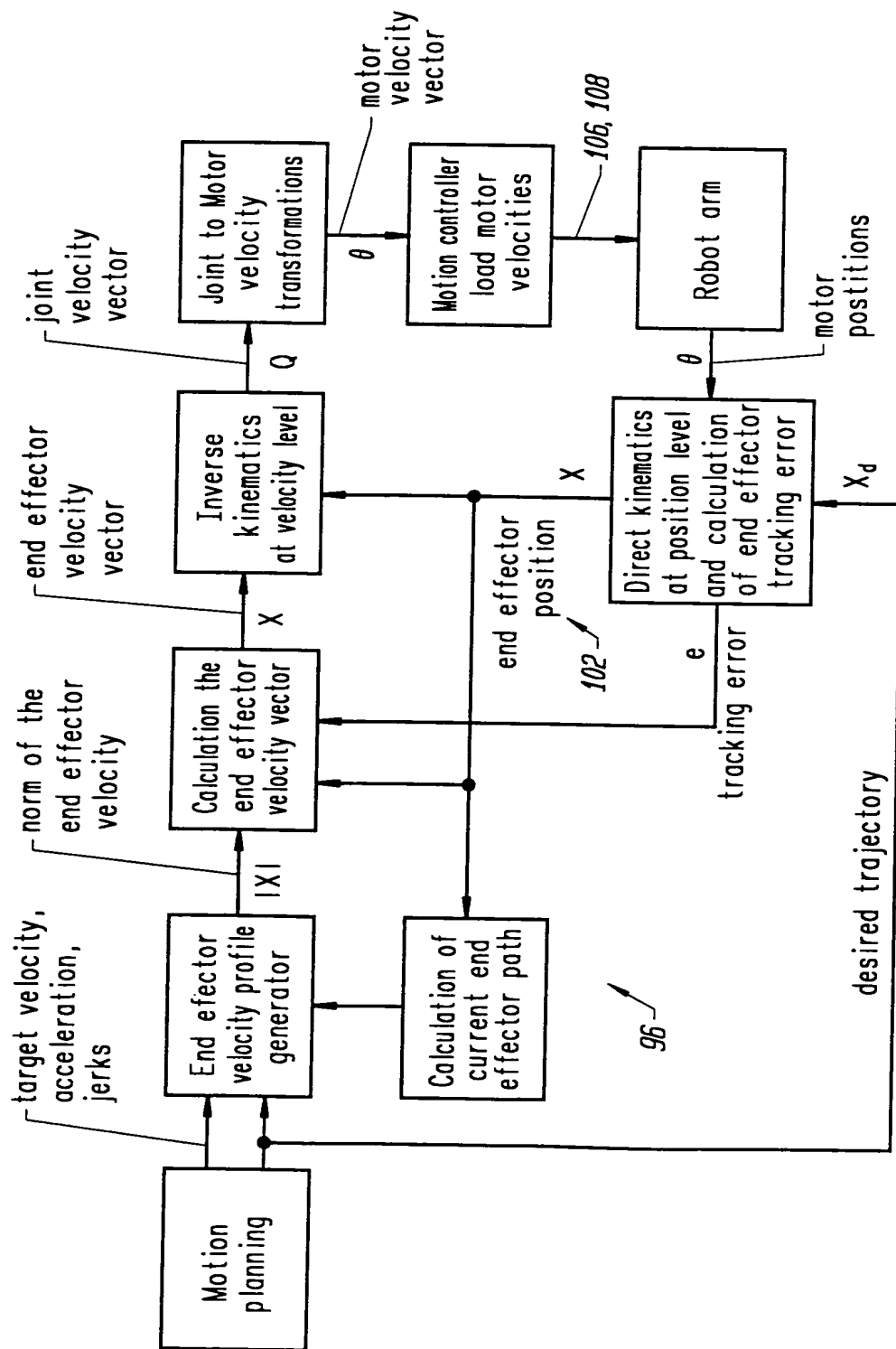


FIG. 8

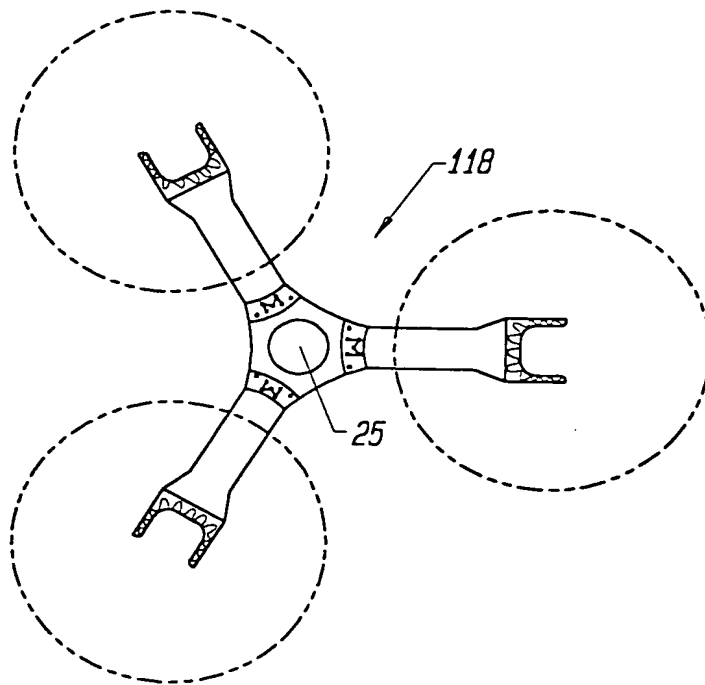


FIG. 9

FIG. 10

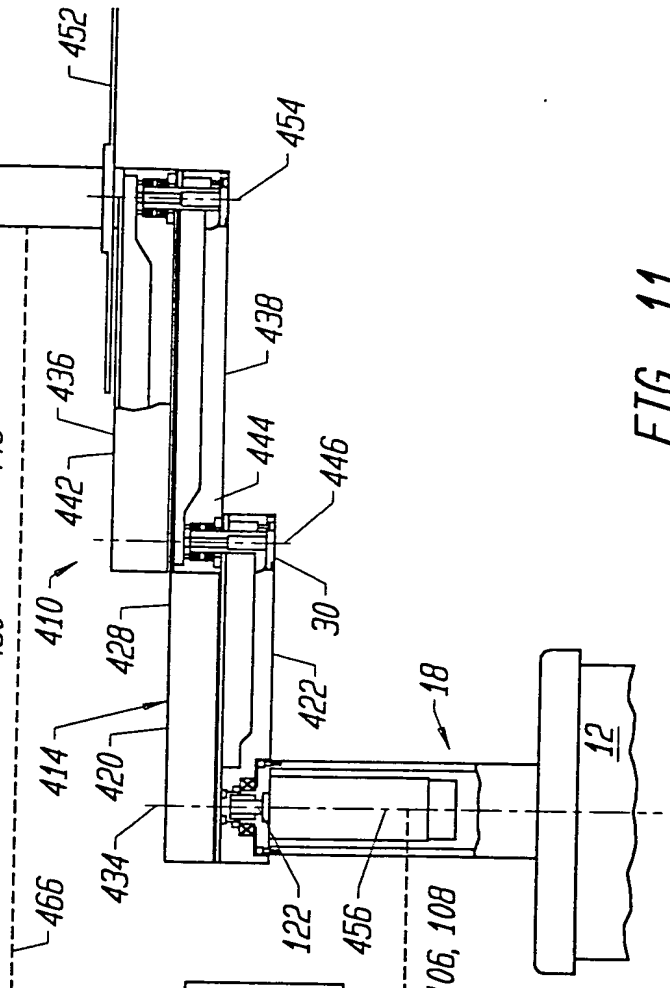
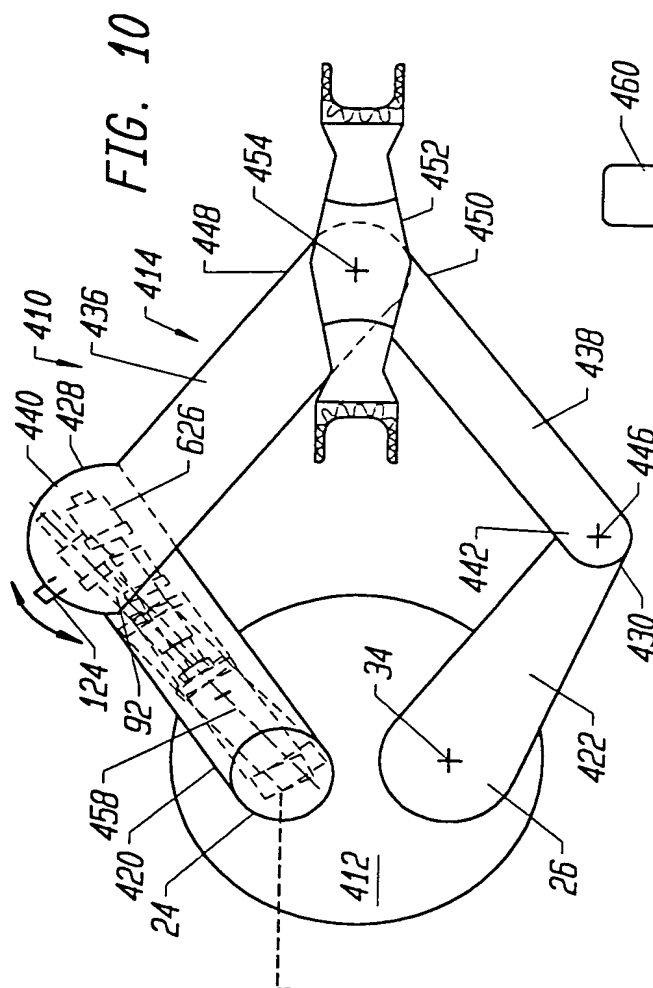


FIG. 11

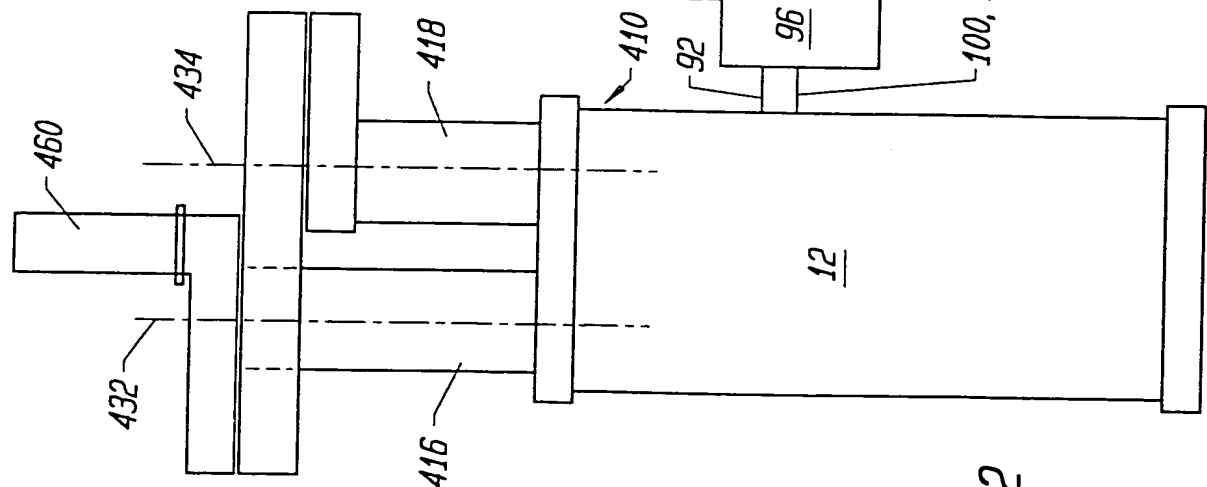
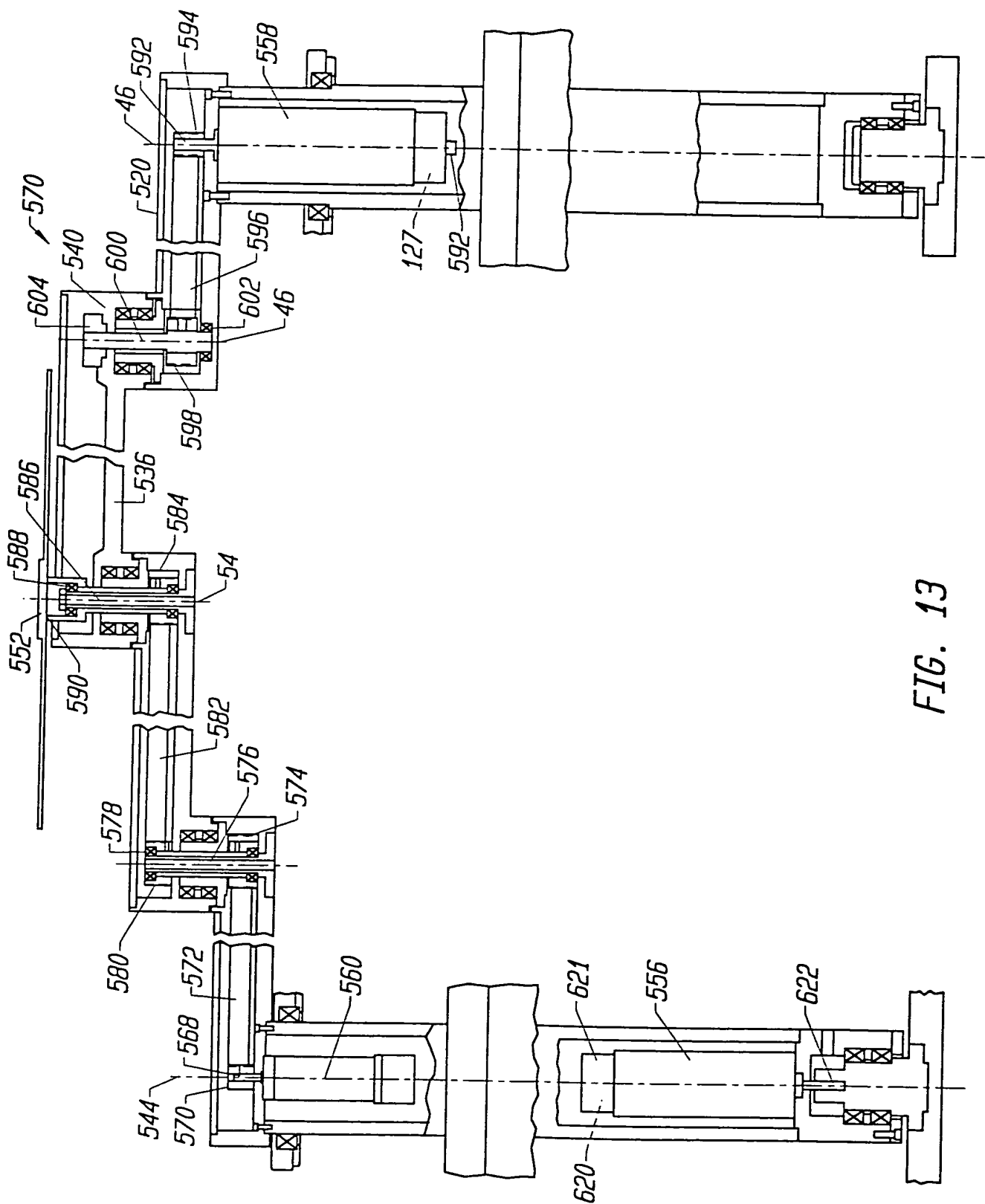
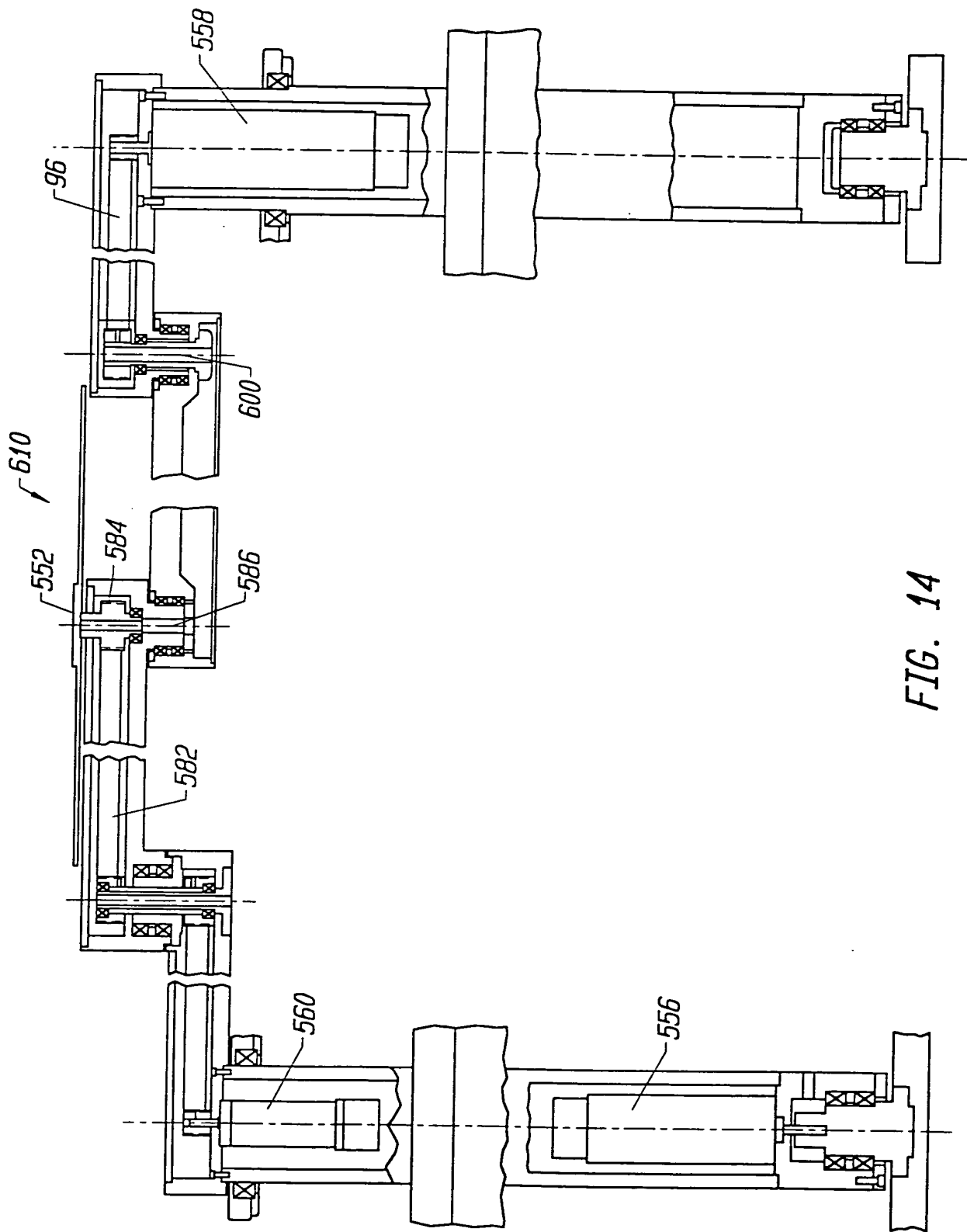


FIG. 12





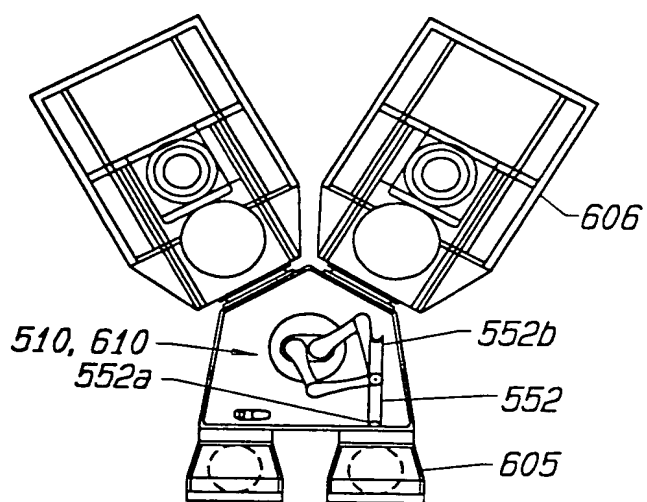


FIG. 15A

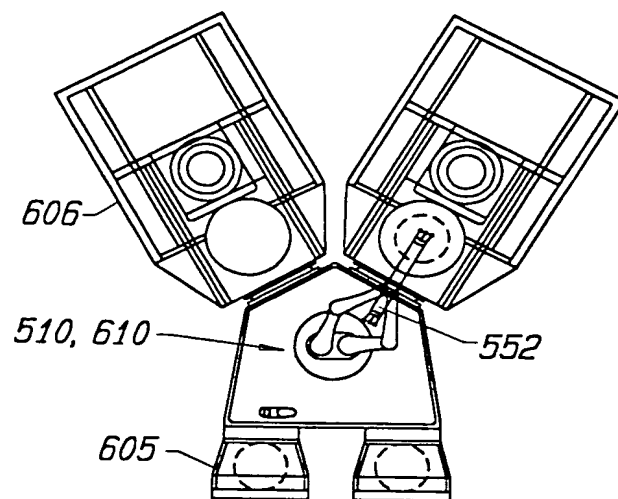


FIG. 15B

A diagram illustrating a three-link robotic arm in a 2D Cartesian coordinate system with axes X and Y . The origin is marked with x and y . The arm consists of three links, each with a revolute joint. The joints are labeled $Q1$, $Q2$, and $Q3$. Link 1 is the base, connected to the origin. Link 2 is connected to Link 1 at joint $Q1$. Link 3 is connected to Link 2 at joint $Q2$. The end effector is a gripper-like mechanism. The diagram shows the arm in a specific configuration, with dashed lines indicating the links and solid lines indicating the joints. A large circle is drawn around the base joint $Q1$. An angle ψ is indicated between the vertical Y -axis and the line connecting the origin to the end effector. The gripper is shown in an open position.

FIG. 16

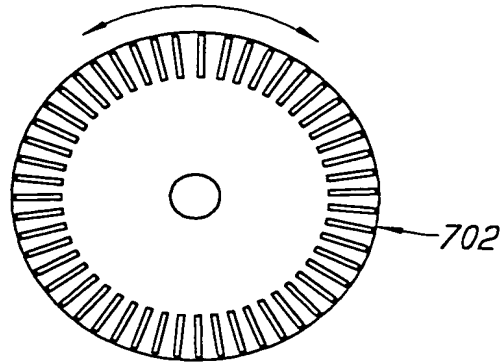


FIG. 17B

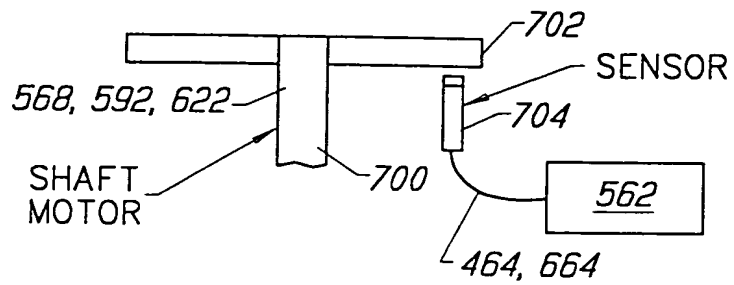
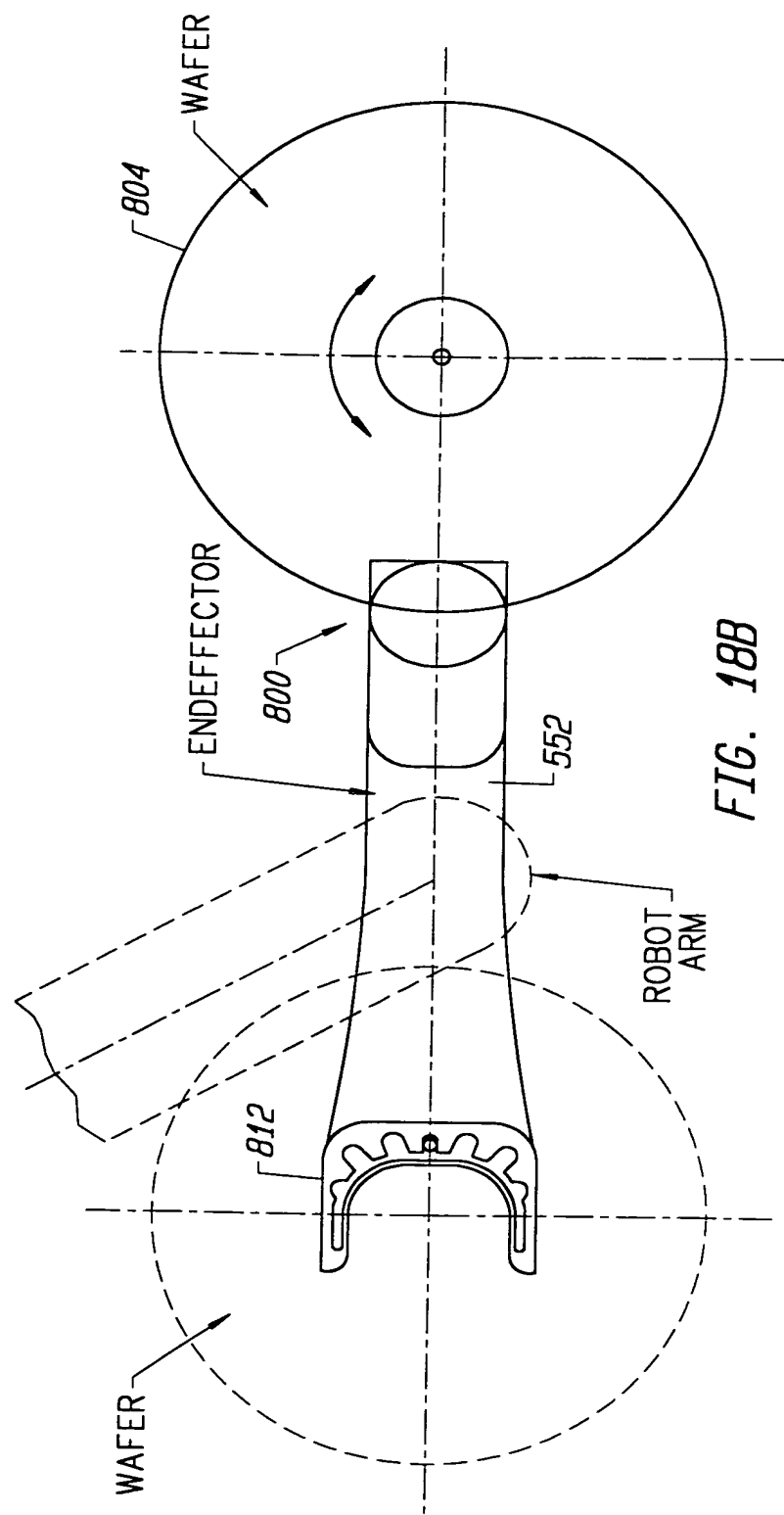
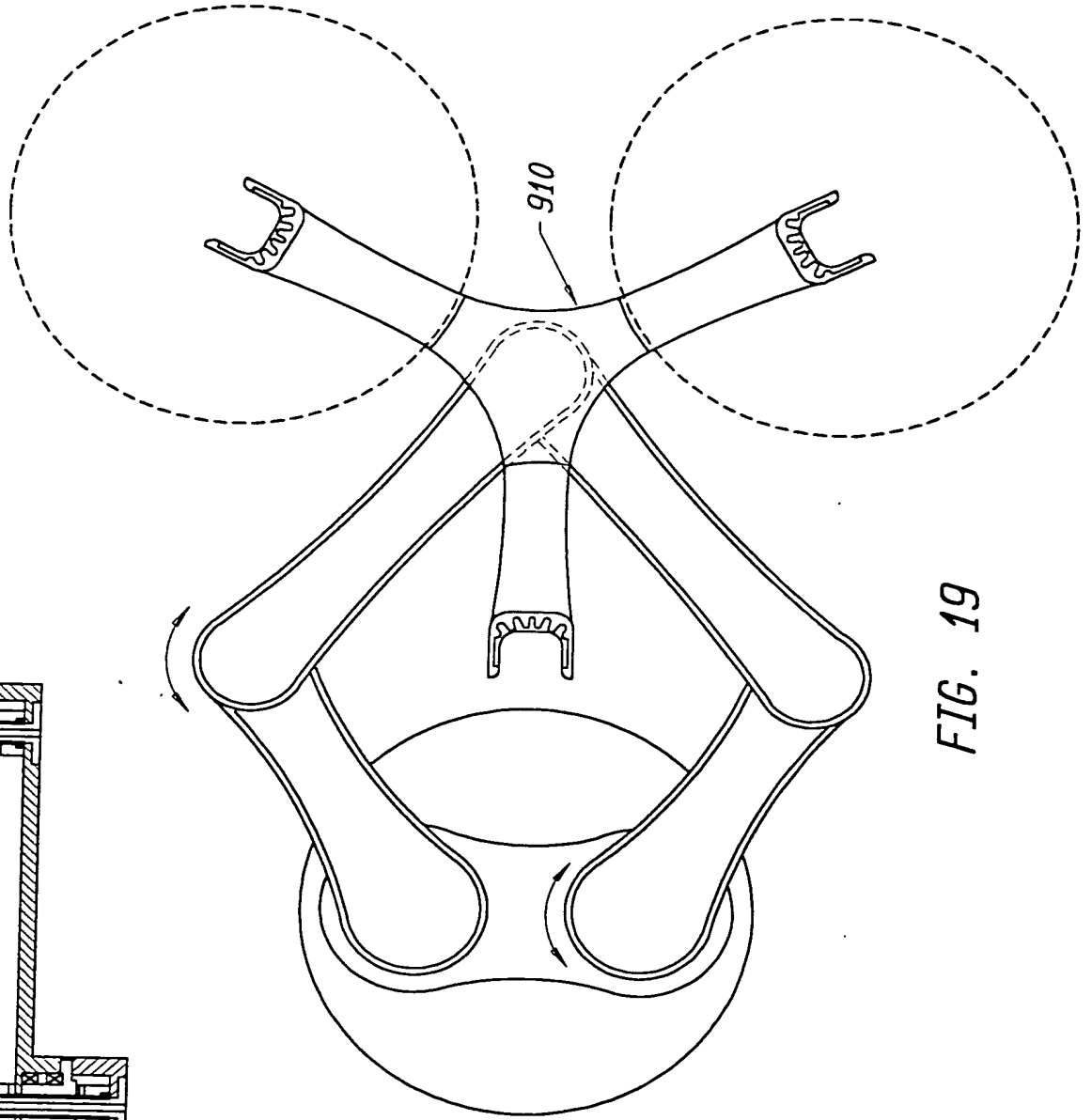
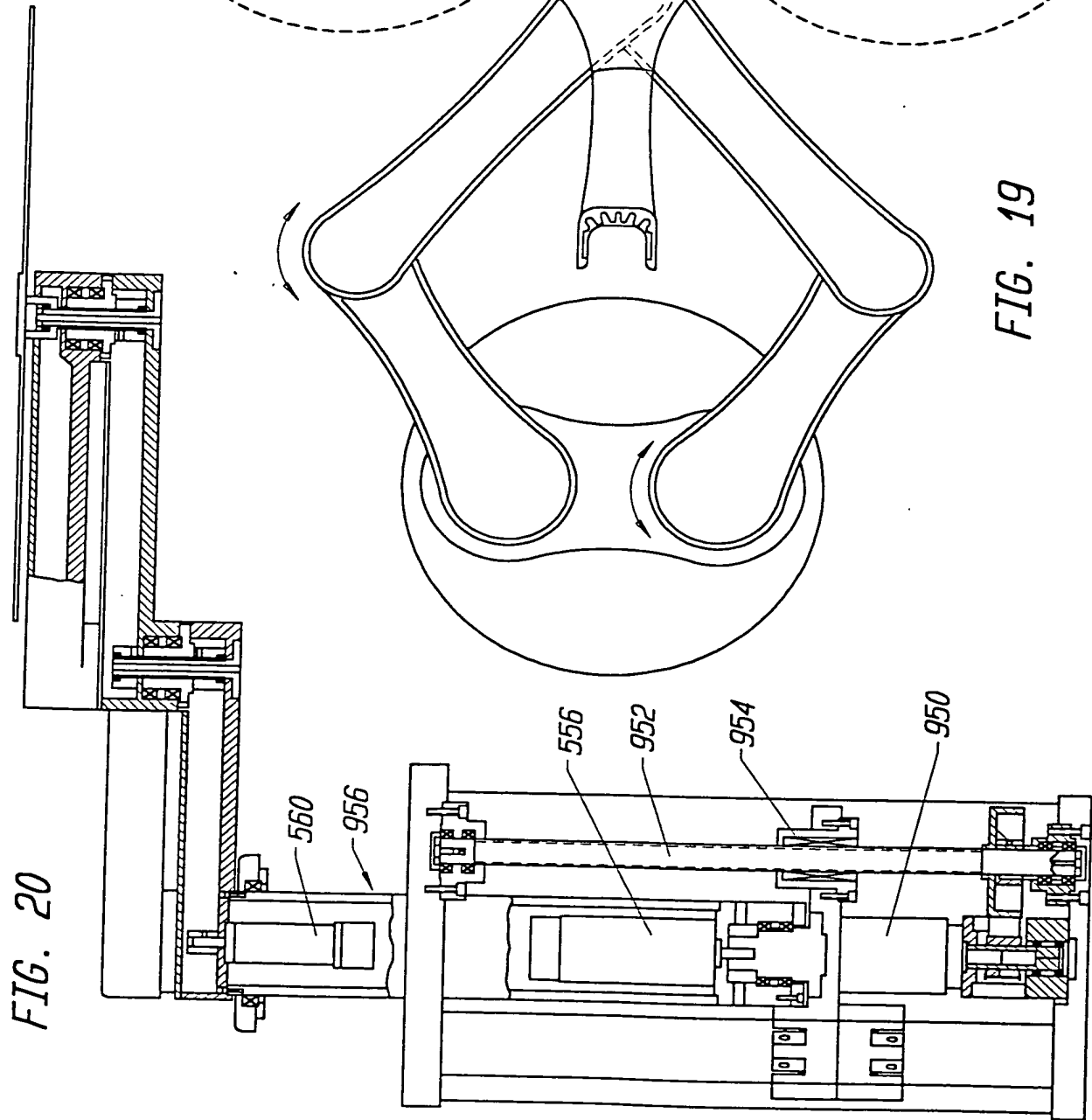


FIG. 17A





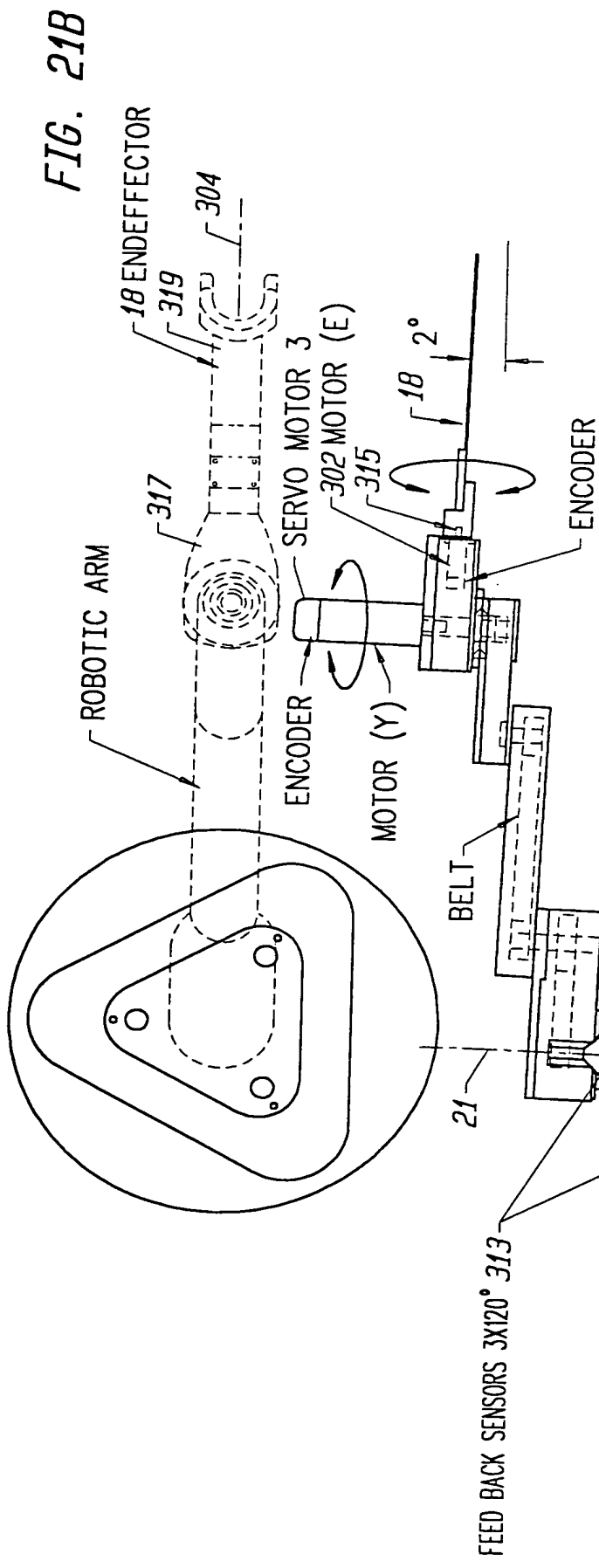
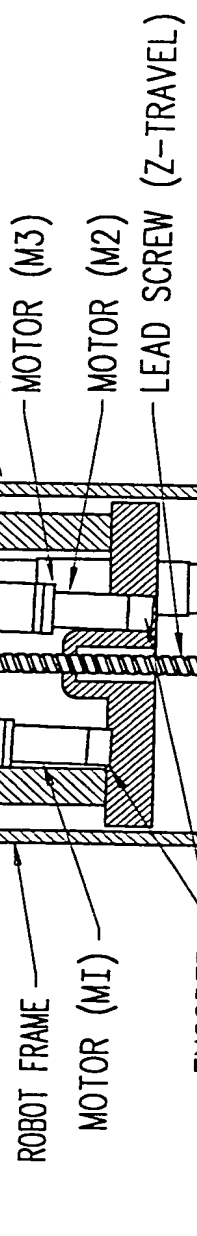


FIG. 21B



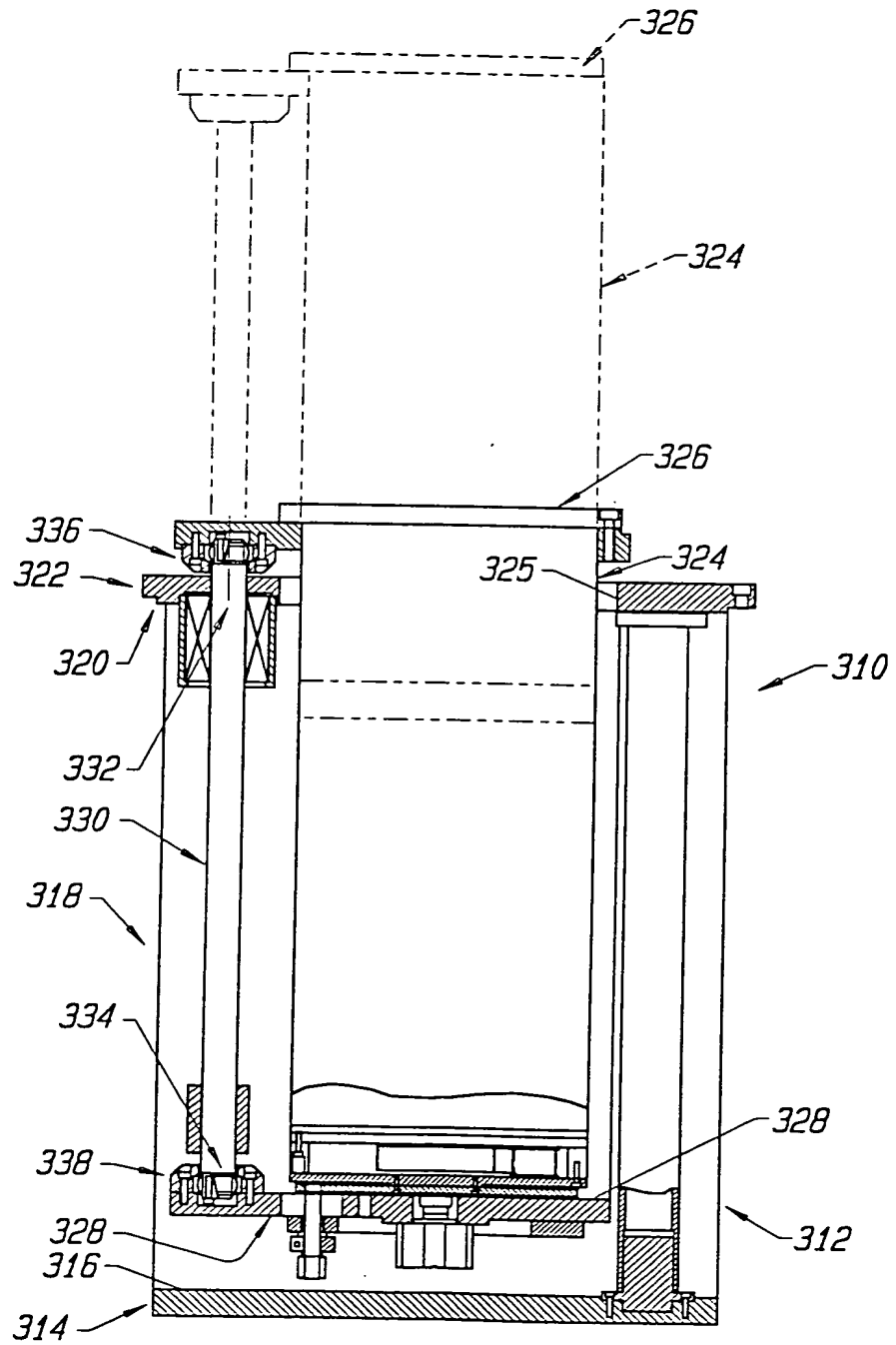


FIG. 22

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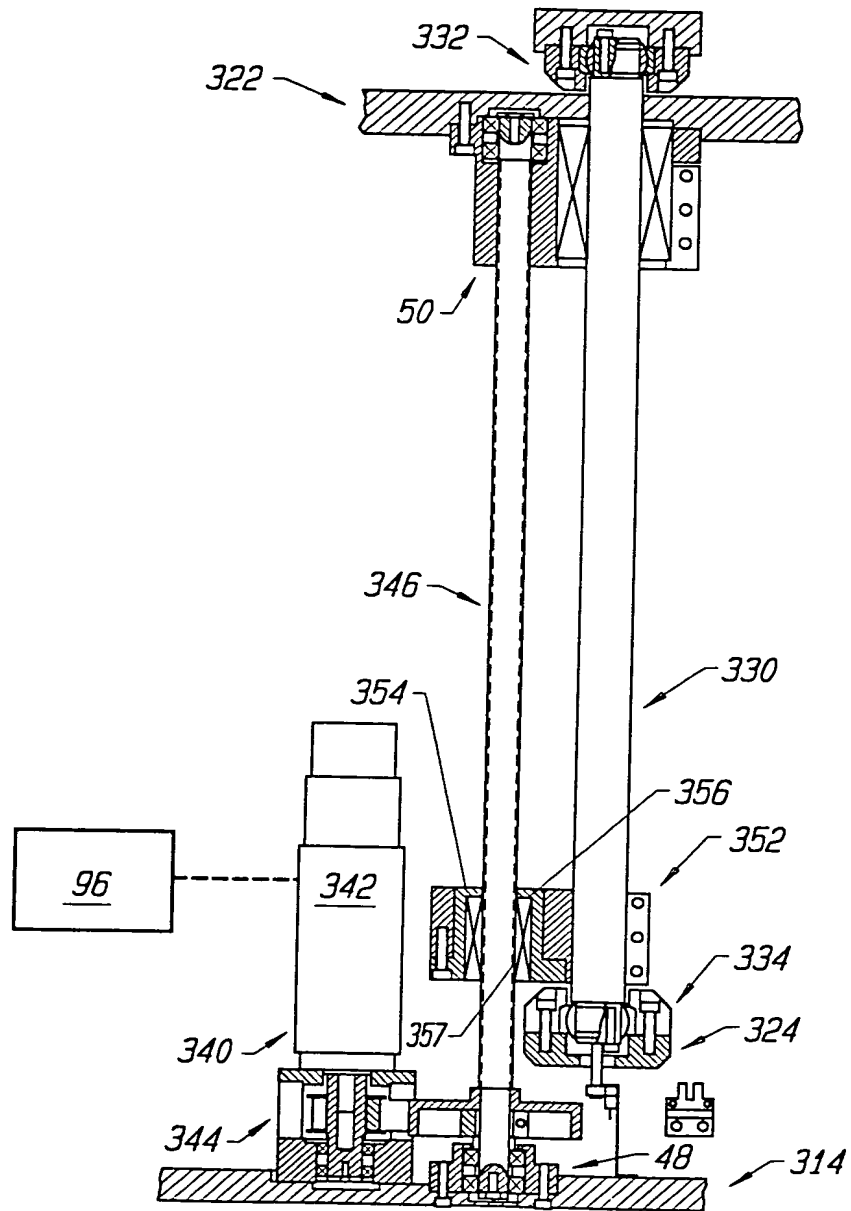


FIG. 23

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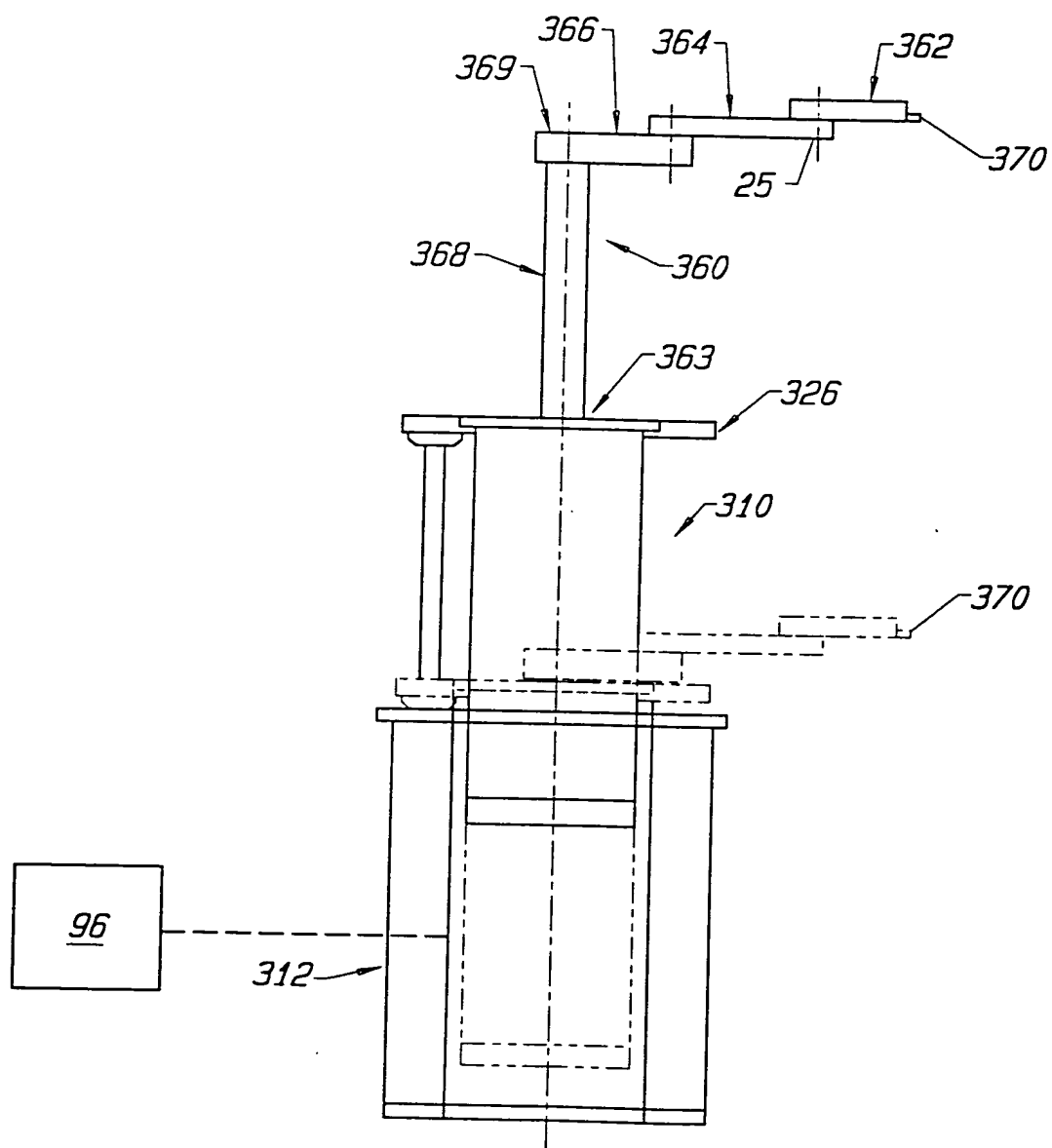


FIG. 24

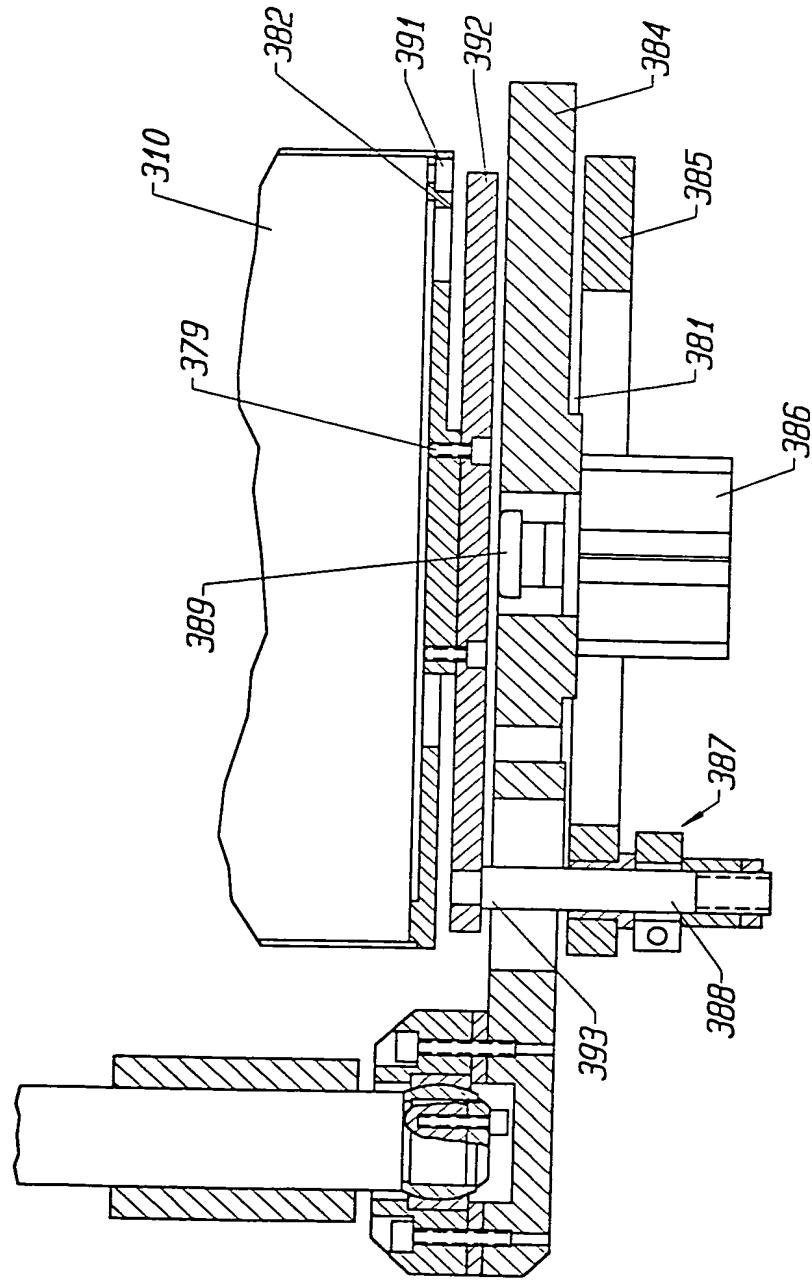


FIG. 25

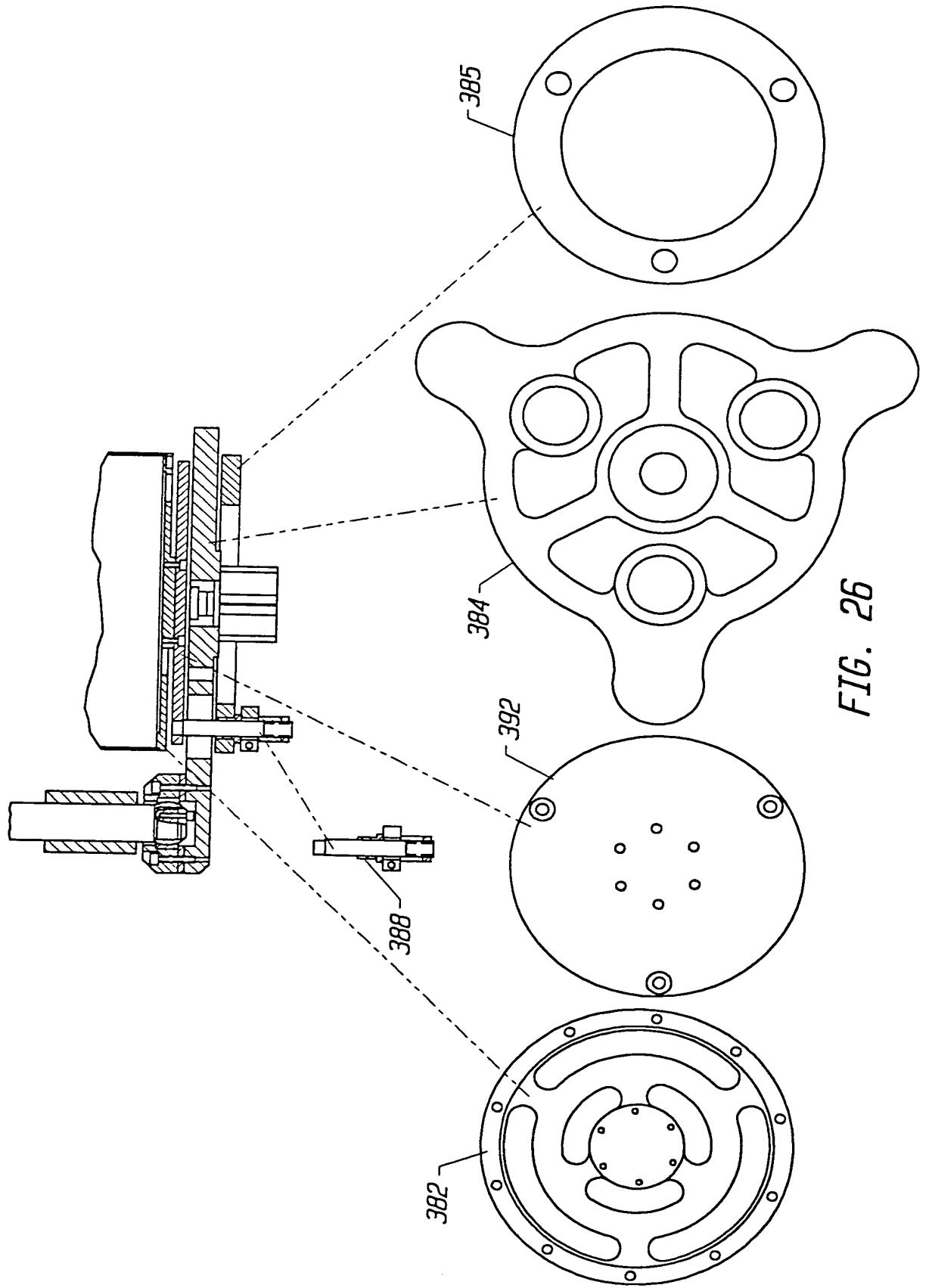


FIG. 26

FIG. 27

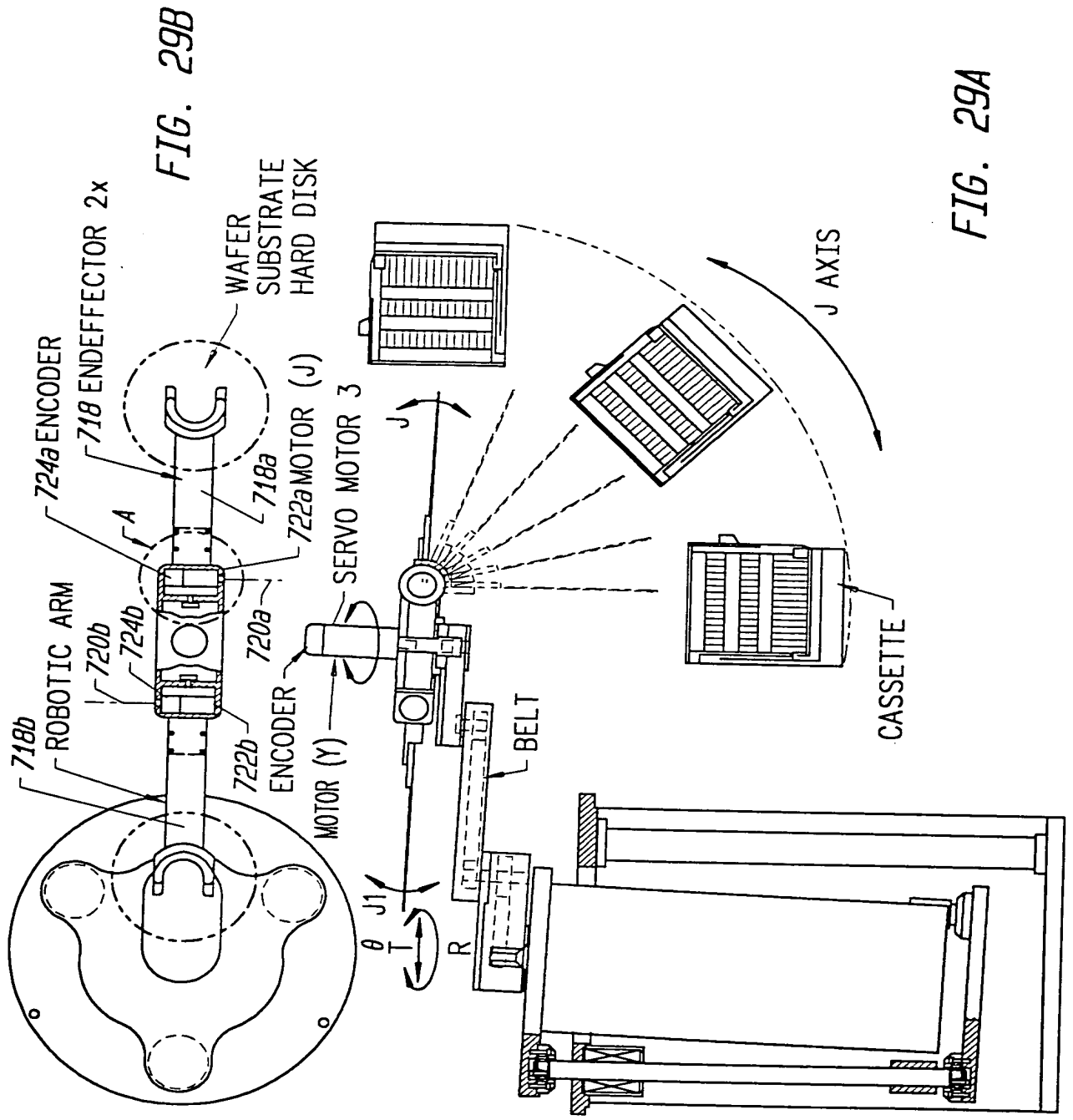


FIG. 29B

FIG. 29A

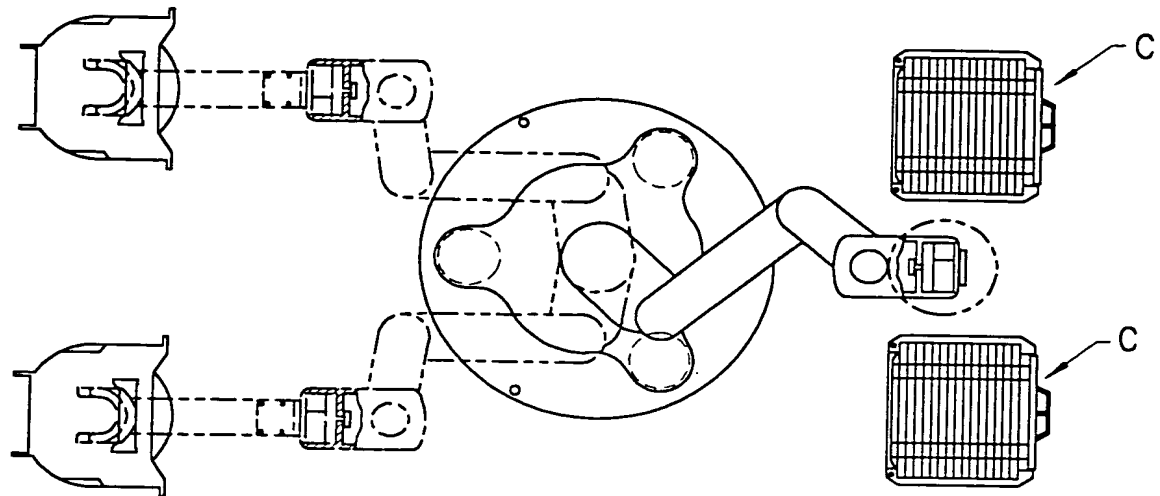


FIG. 30B

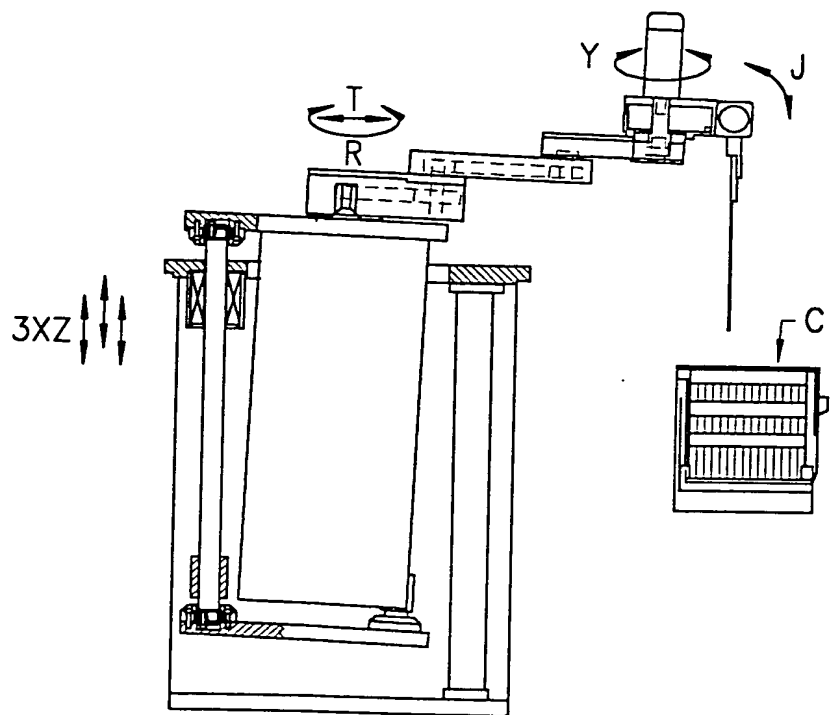


FIG. 30A

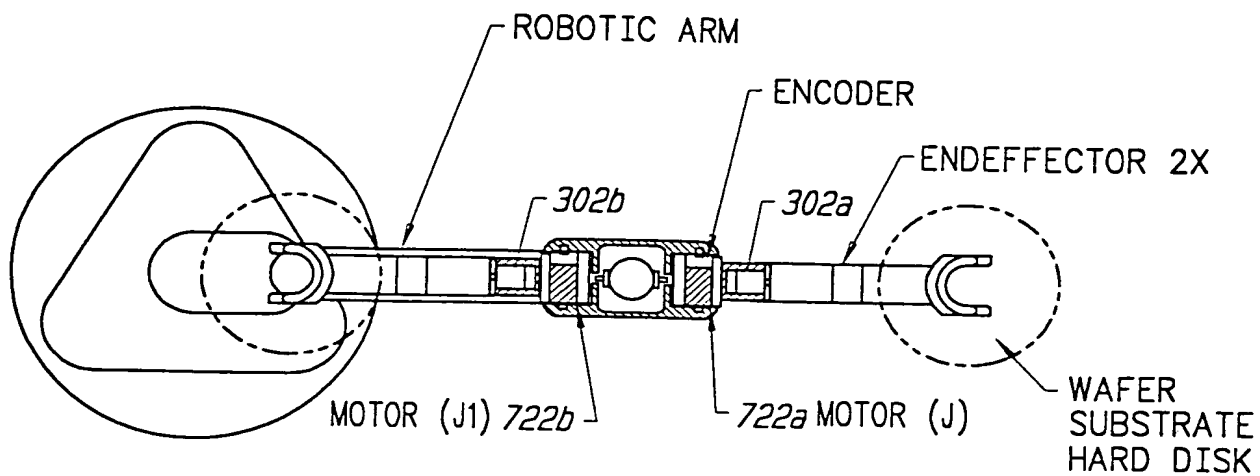


FIG. 31B

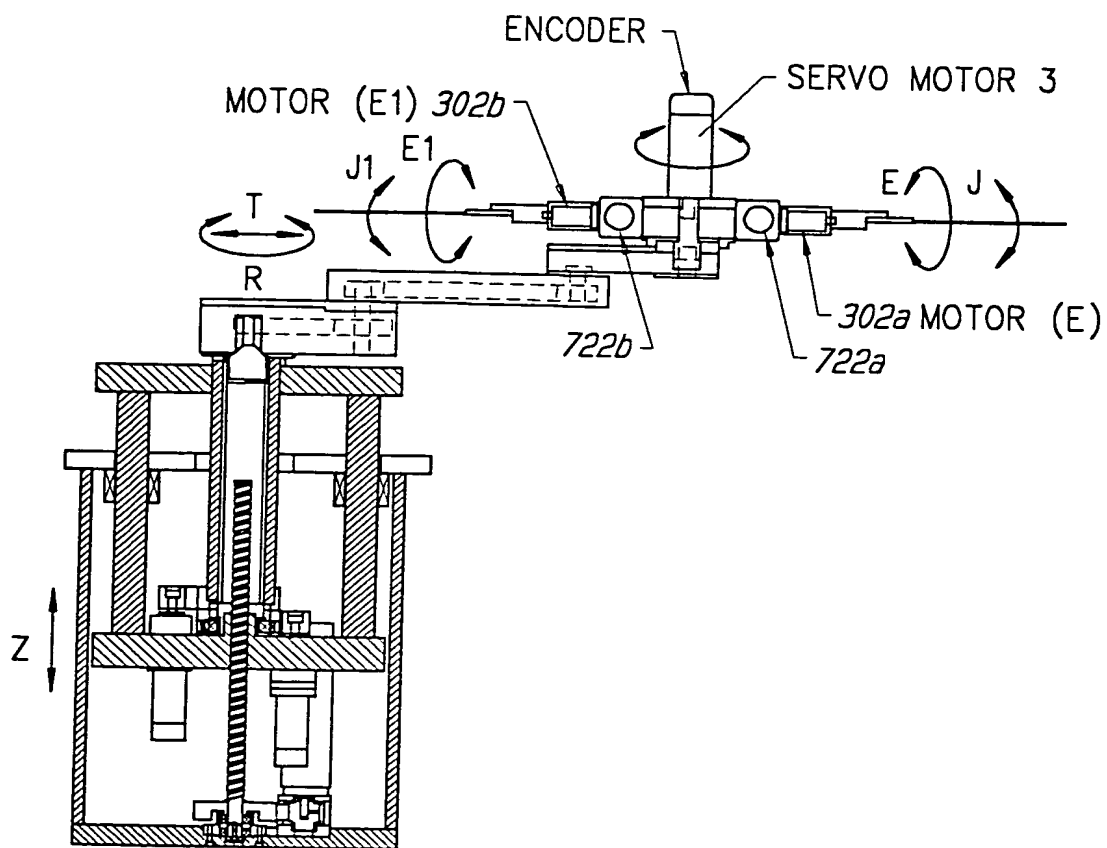


FIG. 31A

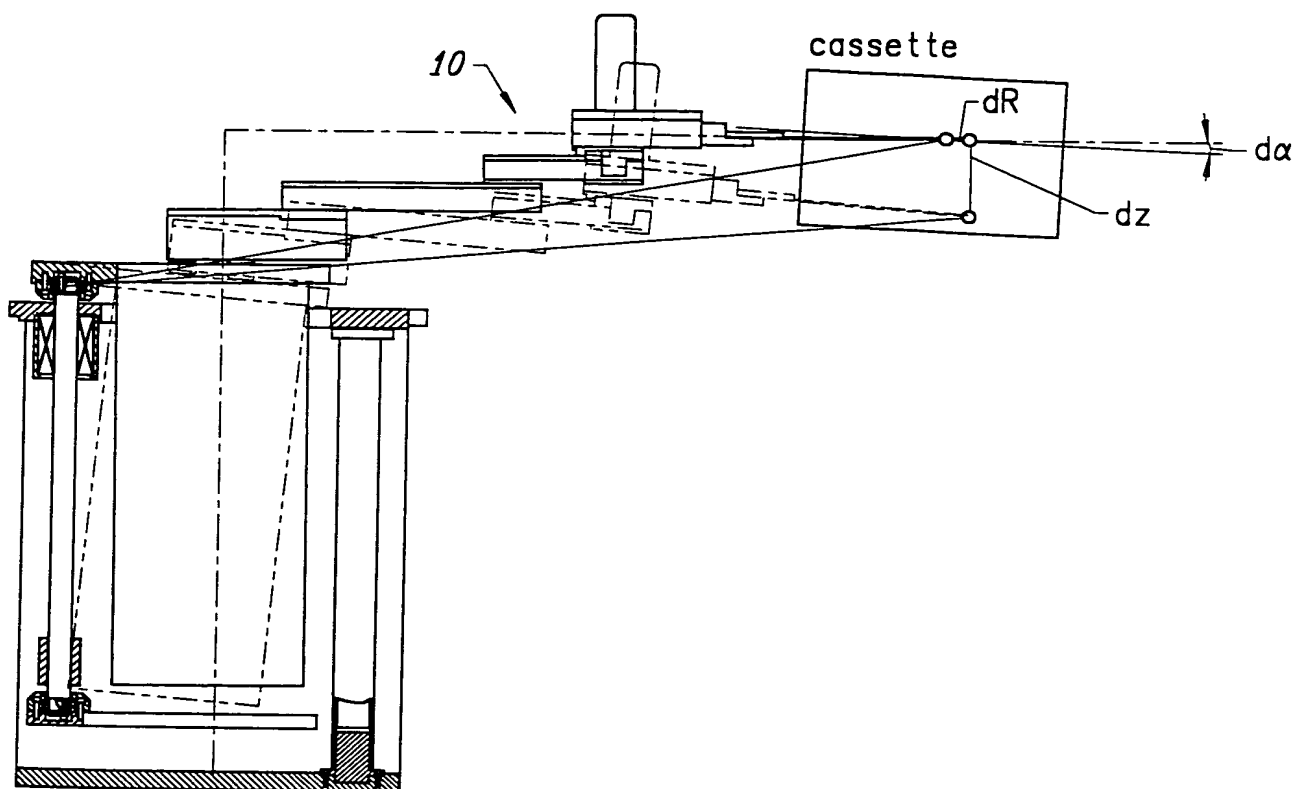
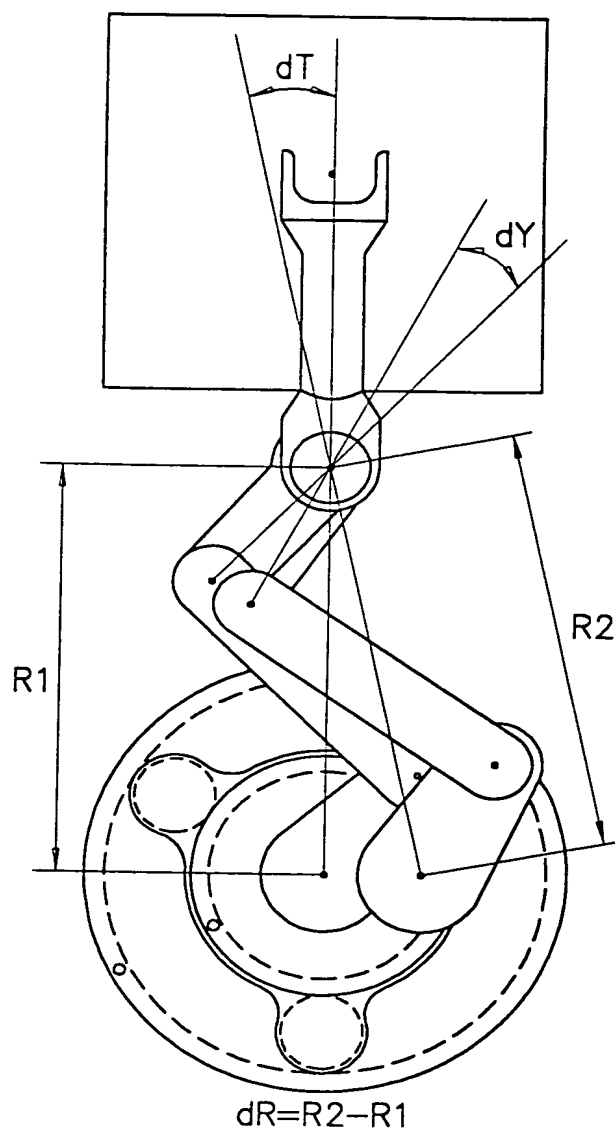
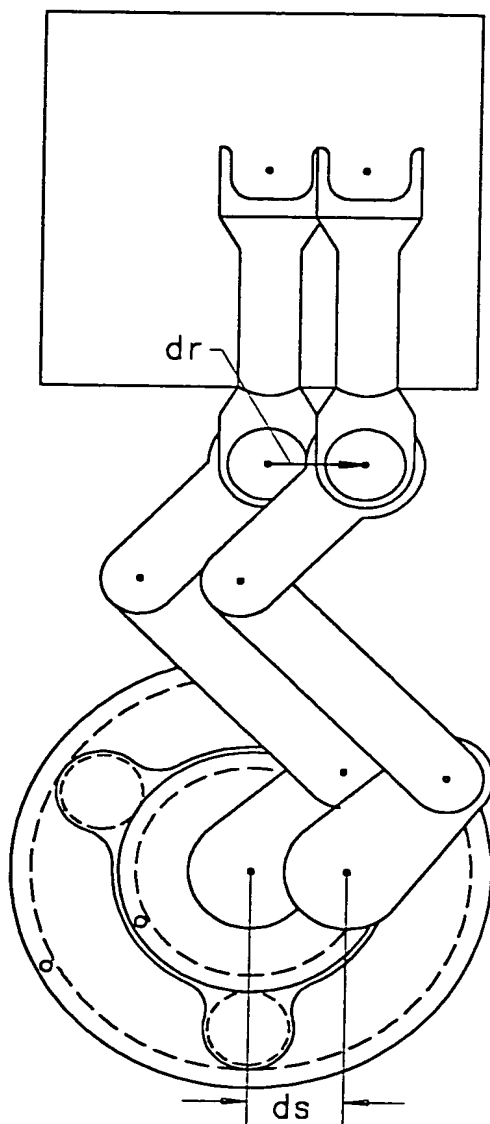


FIG. 32

The diagram illustrates a robot arm system with a cassette. The main components and labels are:

- cassette**: The rectangular block at the top right.
- end effector**: The point at the end of the arm's segments.
- end effector plane prior to compensation**: A shaded rectangular area representing the initial orientation of the end effector.
- robot arm prior to compensation**: The arm's configuration before compensation, labeled with 10 .
- 10 robot arm after compensation**: The arm's configuration after compensation, also labeled with 10 .
- axis of rotation**: A dashed line indicating the pivot point for the arm's movement.
- moving platform**: The circular base on which the arm is mounted.
- spherical joints**: The joints connecting the arm segments to the moving platform.
- 0**: A point on the moving platform, likely the origin of the coordinate system.
- Z**: A vertical dimension line indicating height.
- dr**: A small angle or distance parameter near the cassette.
- da**: A small angle or distance parameter near the joint on the arm.

FIG. 33



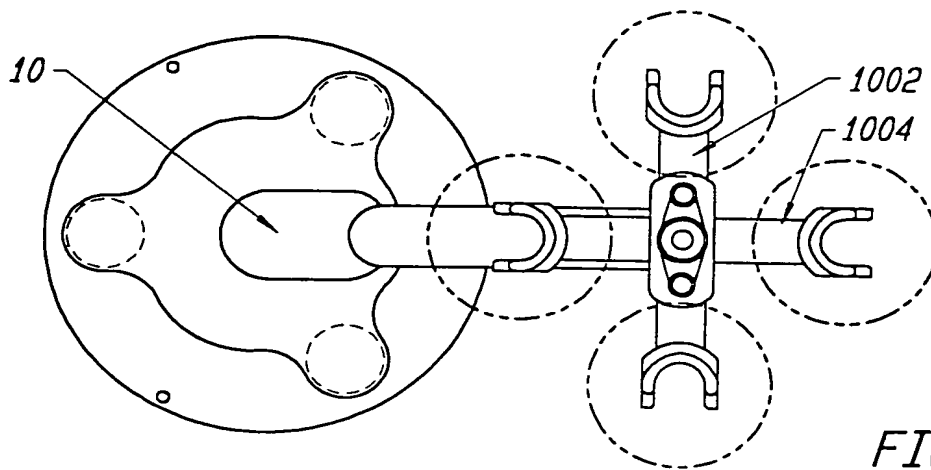


FIG. 35B

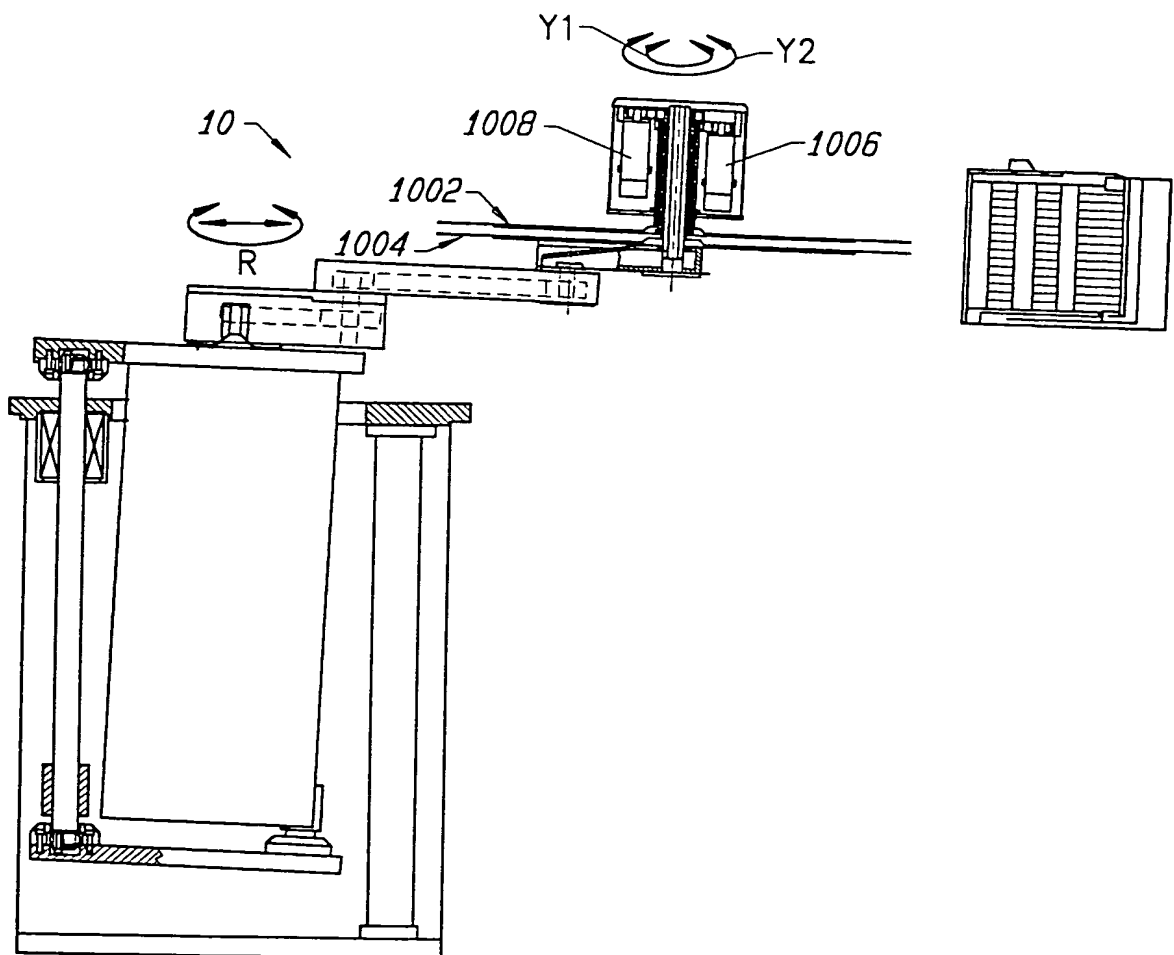


FIG. 35A

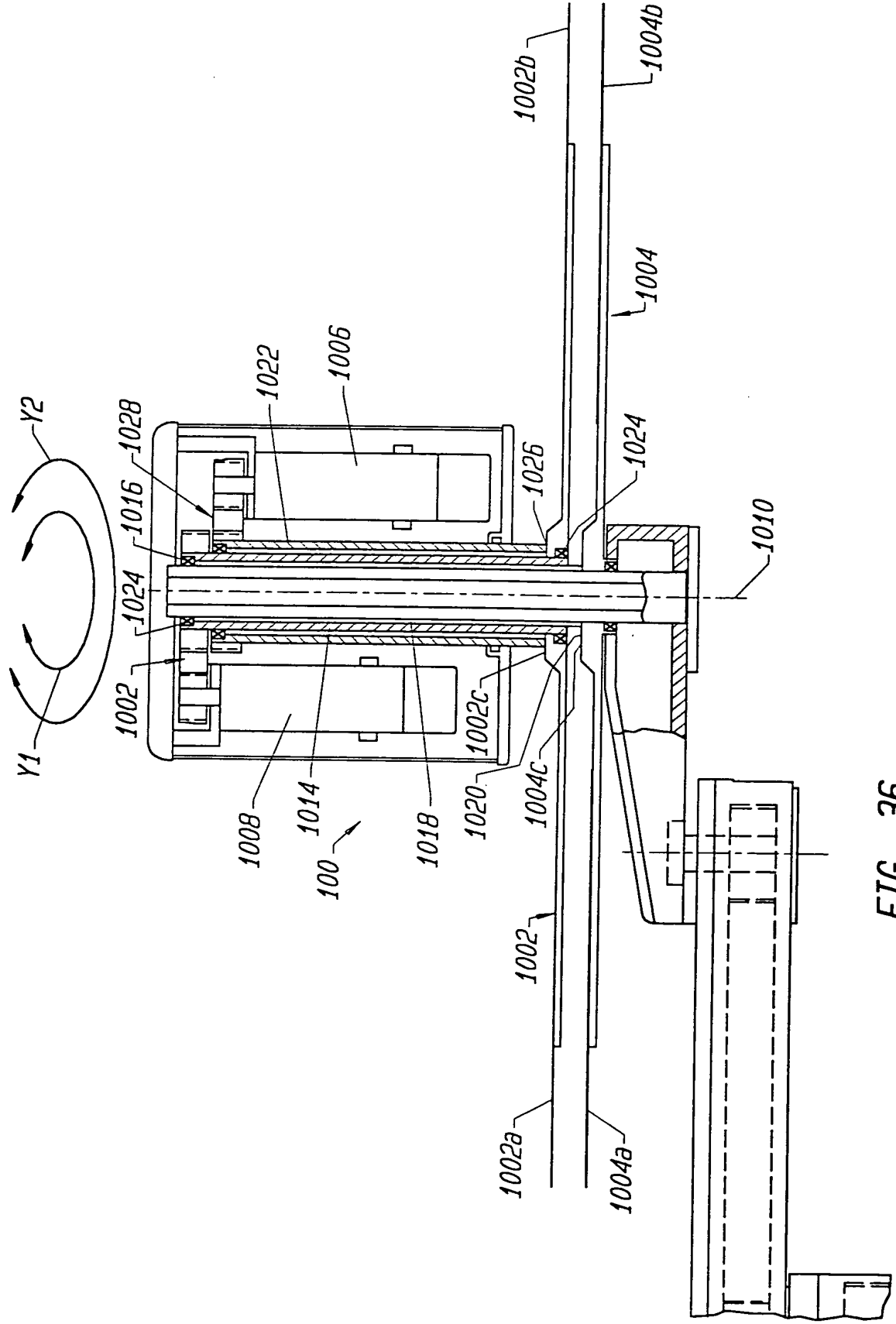


FIG. 36

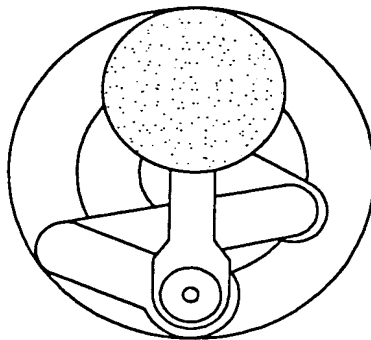


FIG. 38

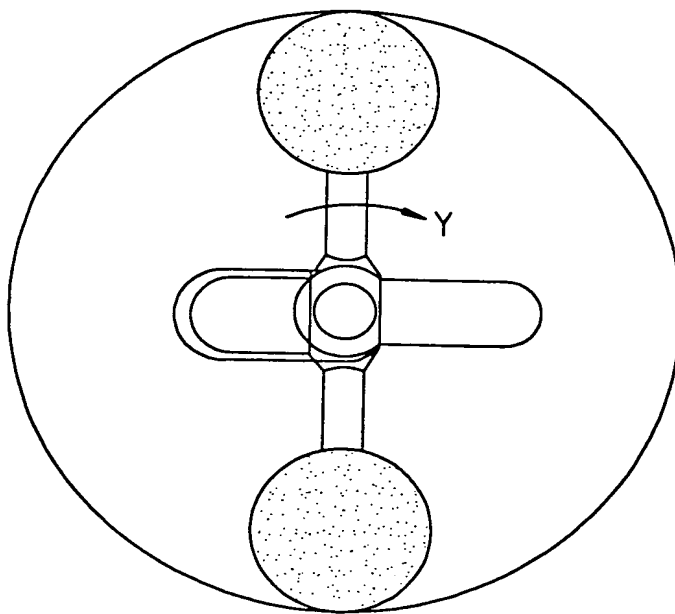


FIG. 37

Process Station

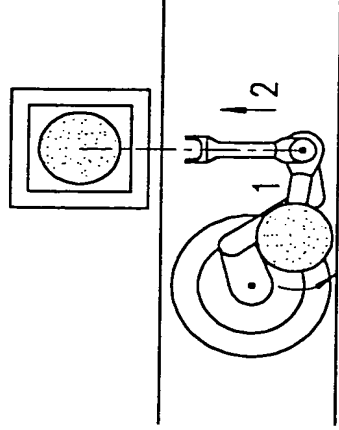


FIG. 39A

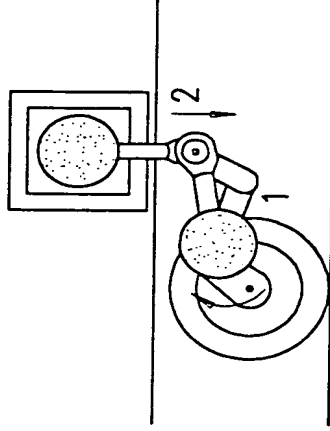


FIG. 39B

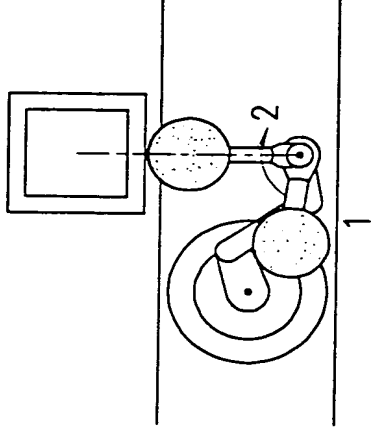


FIG. 39C

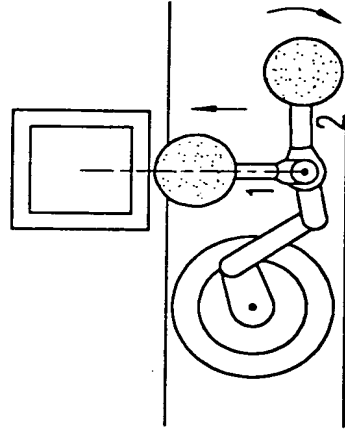


FIG. 39D

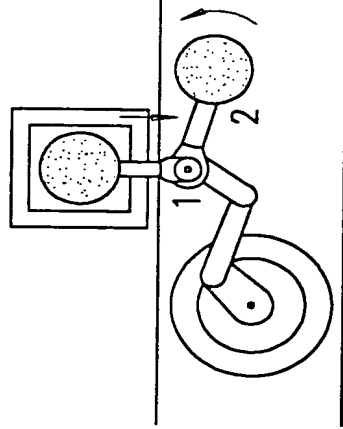


FIG. 39E

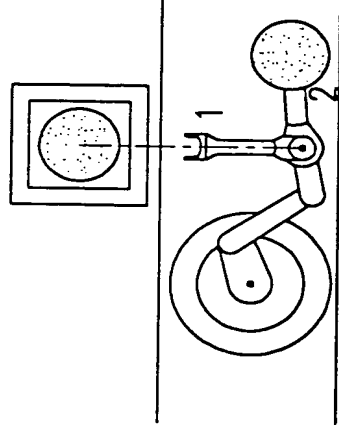


FIG. 39F

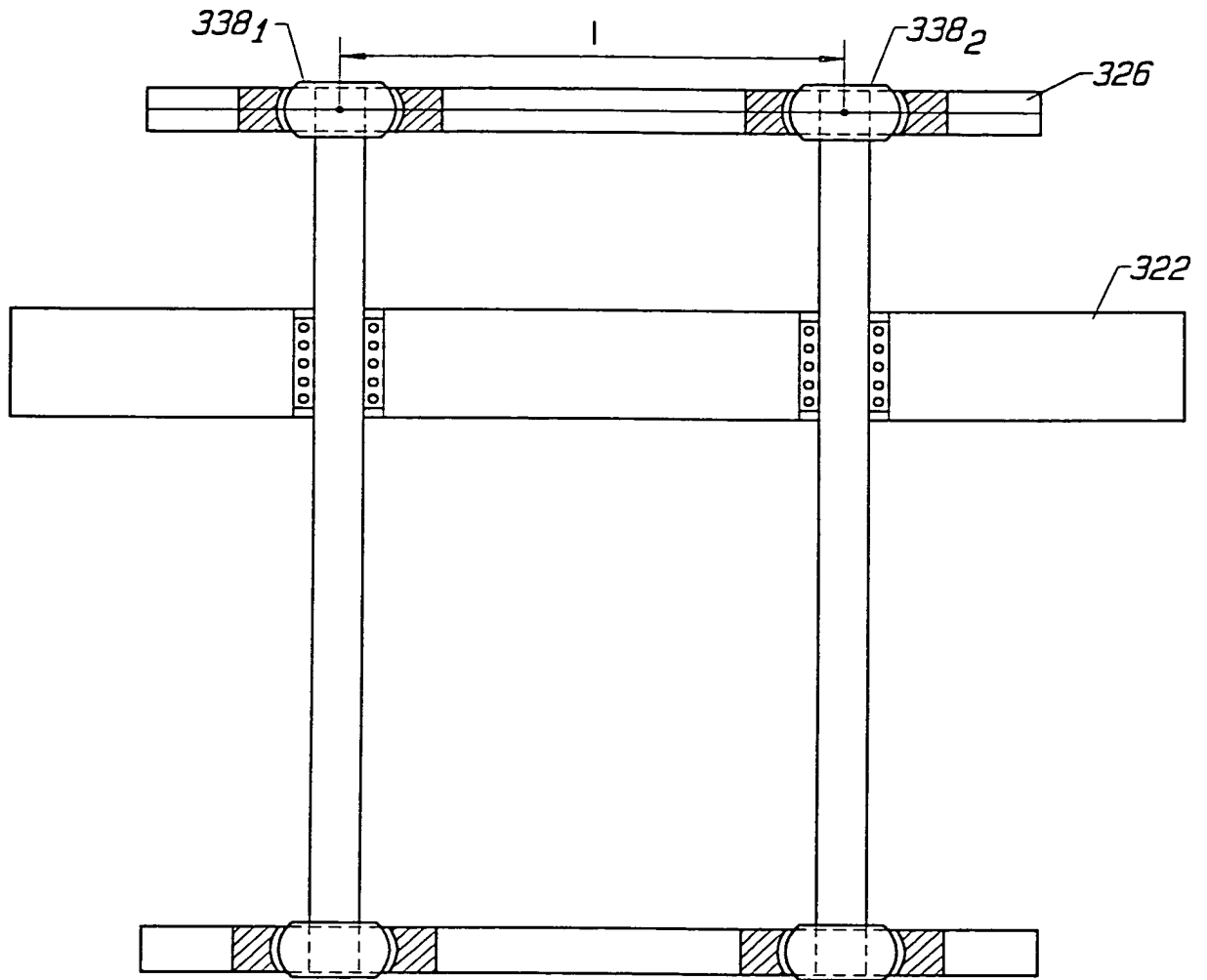


FIG. 40

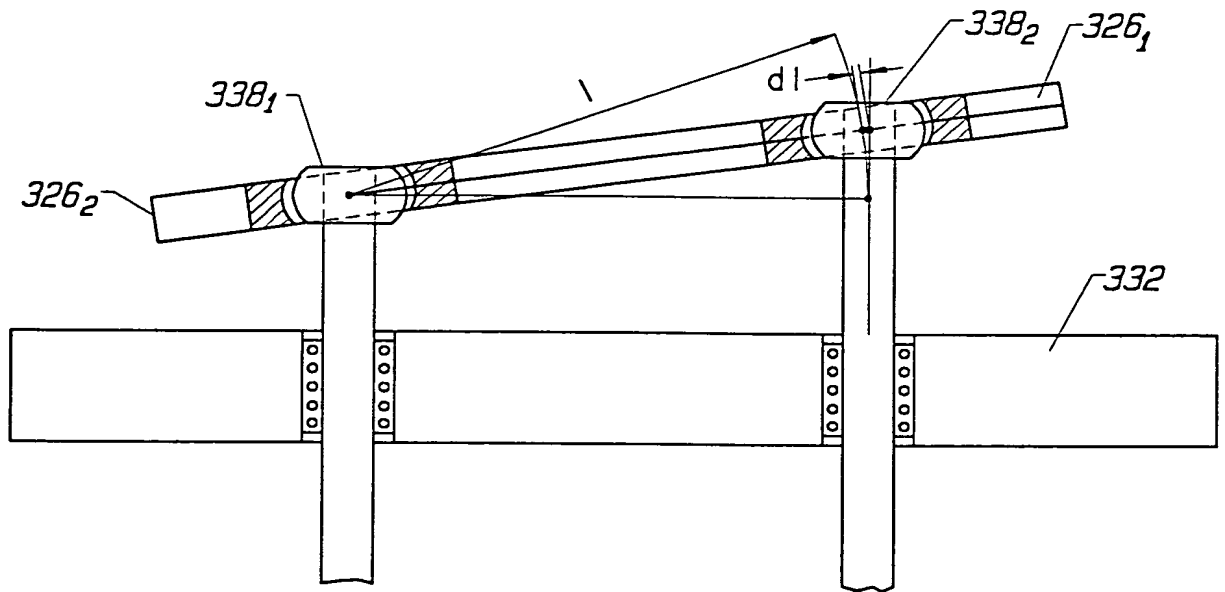


FIG. 41

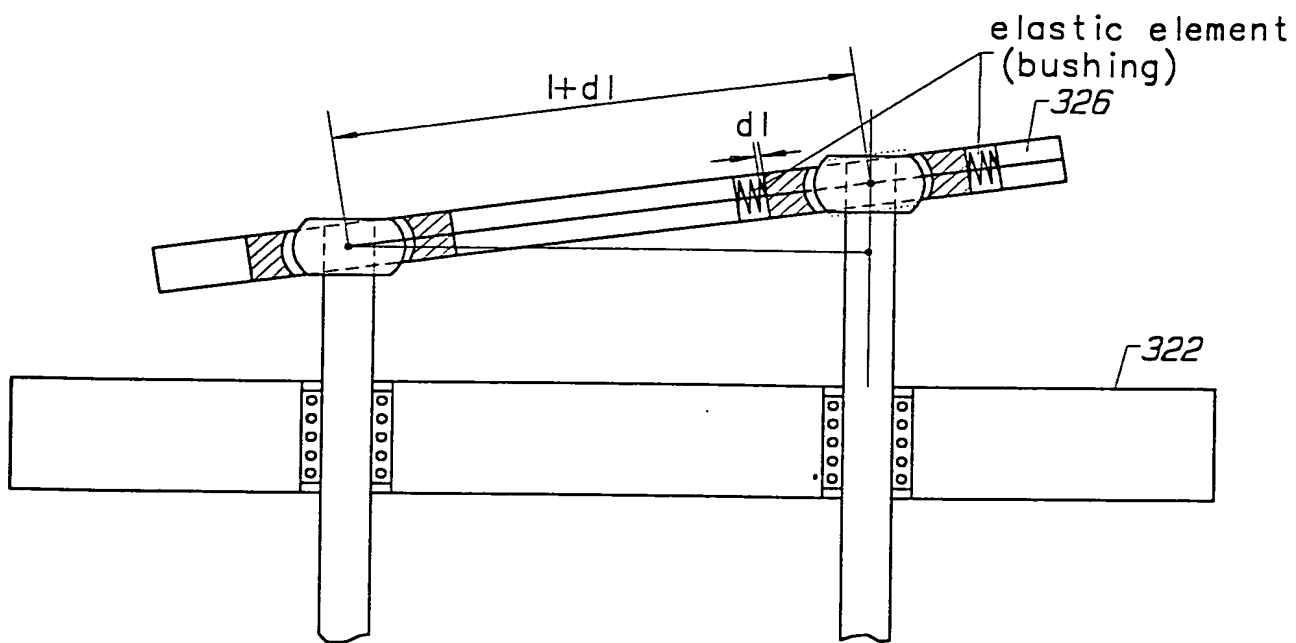


FIG. 42

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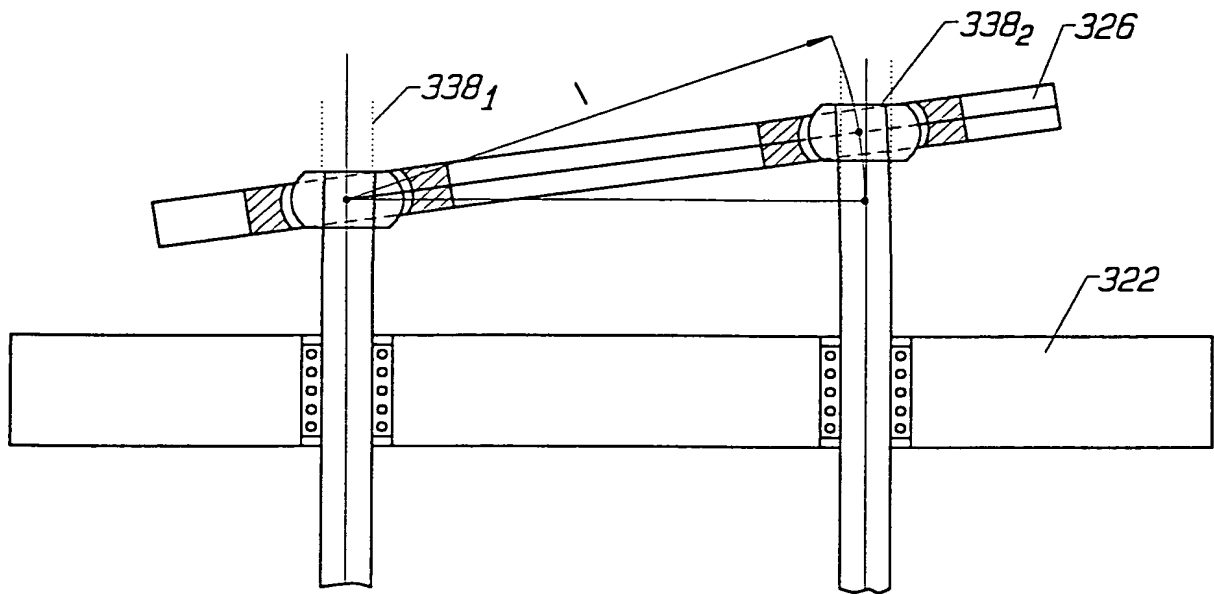


FIG. 43

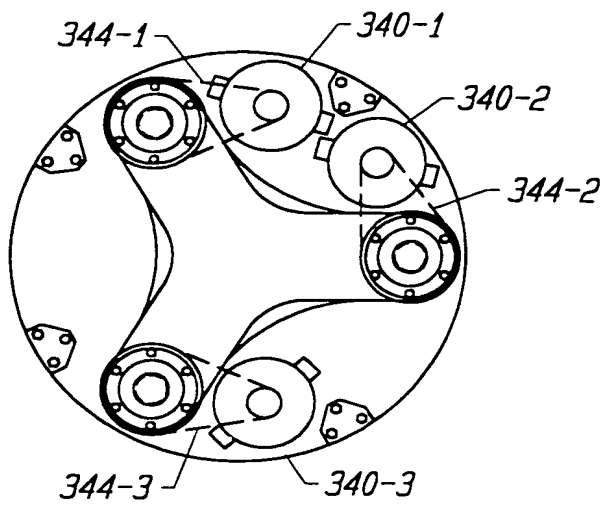


FIG. 46

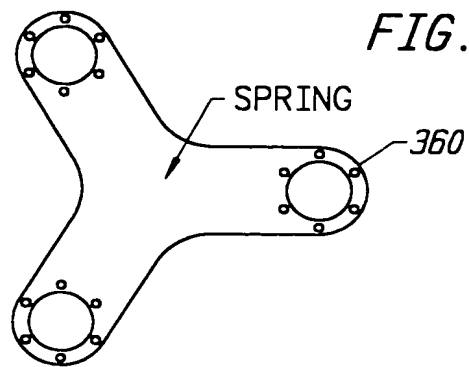


FIG. 47

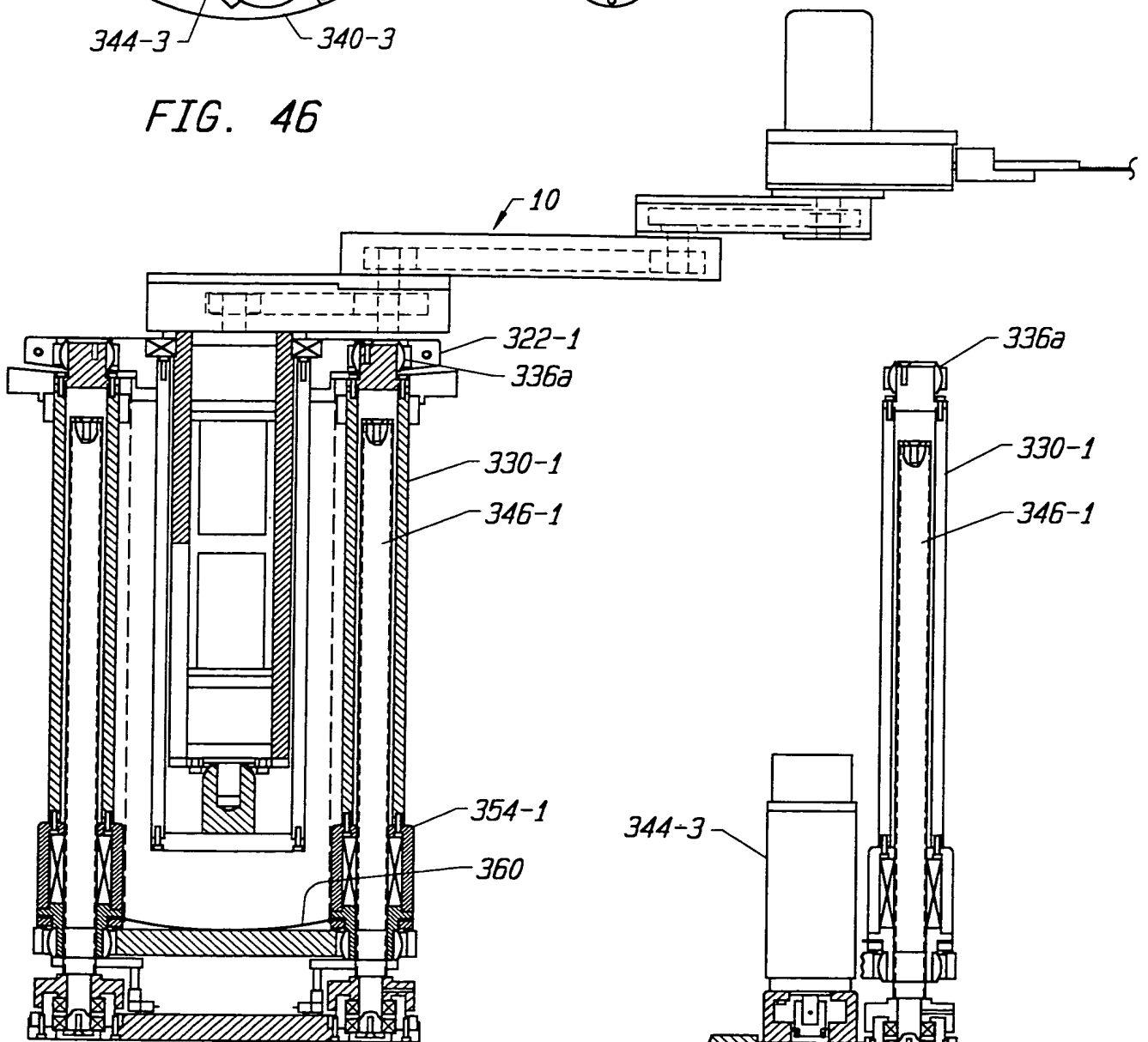


FIG. 44

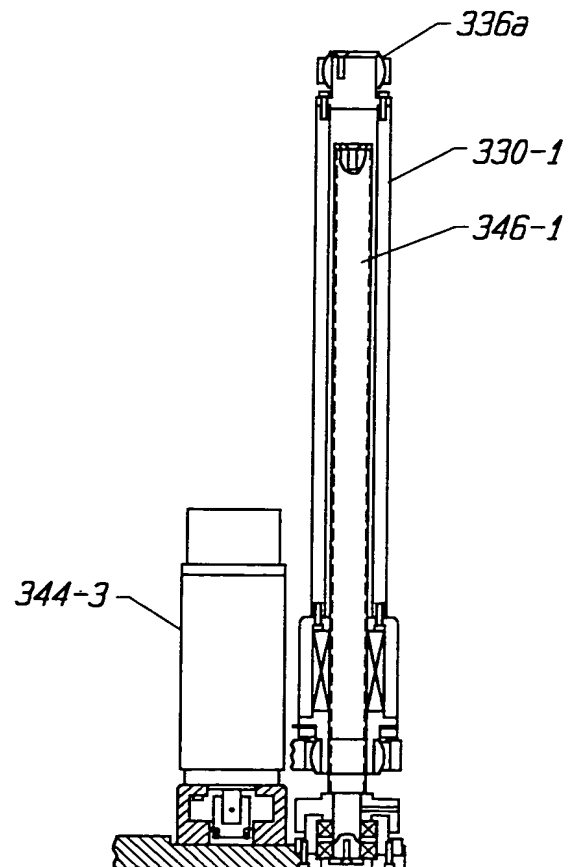


FIG. 45

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